University of Reading

The Impact of Absolute Thinking on Wellbeing

Thesis submitted for the degree of Doctor of Philosophy

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Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Mohammed Al-Mosaiwi.

You can by all means keep your wishes, preferences, and desires, but unless you prefer to remain needlessly anxious, not your grandiose demands.

-Albert Ellis

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Abstract

The goal of this thesis is to investigate the relationship between absolutist thinking and wellbeing. To accomplish this, we first outline the concept of absolutism, before examining how this concept relates to wellbeing.

In chapter 1 we present a literature review of absolutism as it relates to wellbeing, highlighting where there are points of contention or gaps in the research. In chapters 2 and 5, we define absolutism by establishing a distinction - empirically and theoretically - between the concepts of 'absolute' and 'extreme'. We argue that confounding these two concepts has consequential implication. Chapters 2-5, present and validate a new text-analysis based method for measuring absolutism. We discuss the limitations of the previous methods, and compare them to our alternative text-analysis method. In chapters 2-4, we use our text-analysis method to investigate the relationship between absolutist thinking and various mental health groups. We find strong correlations between natural language markers of absolutist thinking and anxiety, depression and suicidal ideation. We provide evidence that elevated use of absolutist words reflects absolutist thinking rather than psychological distress per se. We also present data that indicates absolutist thinking is a cognitive vulnerability for depression and suicidal ideation. In chapter 3 we replicate these basic associations in four non-English languages (French, Spanish, German and Russian). In chapter 2 and 4, we also explore how prominent absolutist thinking is in a community sample, while comparing the relative impact of absolutist thinking and negative thinking to wellbeing. We show that absolute words make up approximately 1% of natural language and are better markers for affective disorder than negative emotion words.

In chapter 6 we briefly investigate differences in absolutist words use between cultures. In chapter 7-8, using a forced choice behavioral paradigm we ask participants to choose which is the "better way to think?", between statements that are absolutely positivity, extremely positive and moderate negativity. We find a high degree of variation in responses. Finally, in chapter 9, we empirically demonstrate that absolutist thoughts are more cognitively rigid than non-absolute thoughts, even when they have the most reason to change.

Introduction

What is absolutist thinking?

This thesis is focussed on a cognitive style which is often referred to as 'extreme thinking' (e.g. Teasdale, 2001), but we have chosen to term 'absolute' or 'absolutist', as we deem that more appropriate. Absolutist thoughts denote a state of uncompromising totality, independent of context and unqualified by nuance. While absolutist thinking may manifest in a myriad of ways, it generally takes the form of either categorical imperatives or dichotomous expressions. Categorical imperatives are absolute, unconditional demands, which apply to all circumstances within a remit. They are commonly expressed using obligatory modal terms like 'have to' and 'must'. Quite often, categorical imperatives are used with reference to goals and behaviour. For example, "I have to get an A in English" or "you must not wear white after labour day". Dichotomous thinking (also known as "all-or-nothing thinking", "black and white thinking", "splitting" or "polarized thinking") is the tendency to conceptualize things in absolute and dichotomous terms (see Neuringer, 1961). This cognitive style is commonly expressed using absolutist words such as 'completely', 'nothing', 'always' or 'never'. Dichotomous thinking frequently applies to an individual's understanding and perception of the world as well as their goals and desires. Crucially, both categorical imperatives and dichotomous expressions are characterised by absolutism.

Thesis Questions

In principal, the concept of absolutist thinking is relevant to all cognition. That is, if an individual is thinking, they are either thinking in an absolute or non-absolute fashion. This holds for any subject matter or content topic; as absolutism is a form of thought, not a topic of thought. Understood in this way, the subject of this thesis would have the broadest possible remit, as it applies to any type of cognition.

Clearly therefore, this PhD cannot examine all aspects of absolutist thinking. We will set out specific aims, relating to absolutist thinking and psychological well-being, that will focus the research. However, readers should note, that due to the universal applicability of absolutism to cognition, many of the findings presented here will have relevance beyond the specific questions addressed.

(1) The Distinction Between Absolute and Extreme

First, we aim to better define absolutist thinking, by differentiating it from 'extreme thinking'. Extreme (but not absolute) thinking, relates to beliefs or thoughts that greatly deviate from accepted norms. Specifically, the further a position is from the population 'mean', the more extreme. In this way, extreme beliefs lie on a continuum and do not have the same categorical nature of absolute beliefs.

As will be seen in the next chapter, the terms absolute and extreme are currently used interchangeably in the literature. This is in large part due to their respective lack of moderation, as well as a failure to recognise the difference between holding fringe views which lie on a continuum, and absolute categorical beliefs. Moreover, absolutist beliefs are themselves often extreme since they usually greatly

deviate from accepted norms. Note that while absolutist beliefs can often be extreme, extreme beliefs are quite often not absolutist.

This has led to a large degree of confounding between the two concepts in the extant literature. We argue that there is a consequential and qualitative difference between extreme and absolutist thinking. Unlike absolute beliefs, extreme beliefs retain some degree of nuance and context dependence; they implicitly recognise the existence of an underlying continuum of possible alternative positions. Conversely, absolute beliefs, do not acknowledge the possibility of any alternative.

More importantly, absolute claims about the way the world is cannot be justified, while extremes potentially could. Many beliefs which are commonplace today, had at one time been considered extreme. Galileo was sent to the inquisitions for affirming that the earth was a sphere and not the centre of the universe, an extreme position at the time, but not irrational. On the other hand, claims of absolute certainty or magnitude about the world, cannot be justified. Given that we have to make allowances for the limitations of human knowledge and understanding, it is difficult to conceive of anything that can truly be said to be an absolute. Even our most cherished and fundamental axioms about the world are not invulnerable to modification or rejection. Note, we are not here referring to *analytic* propositions, as defined by Immanuel Kant in his 'Critique of Pure Reasoning' (Kant, translated by smith, 1934), where the "predicate concept is contained in its subject concept" (e.g. a square has four sides). Analytic propositions can be absolutes, as their truth does not depend on any relation to the world. We will not further indulge in a deeper philosophical discussion here; it is enough to say that for truth claims that relate to the world (*synthetic* propositions), absolutes cannot be justified.

(2) Measuring Absolutism

I intend to develop a procedure for measuring absolutist thinking. Naturally, this construct has previously been measured in different ways, chapter 2 will outline these existing methods. We however, aim to develop a method that has more ecological validity than those previously employed. This is predicated on measuring absolutism in the main form in which it is ordinarily expressed, namely natural language. Our contention is that absolute thinking is signified through the use of absolutist words (i.e. always, never, completely etc.).

(3) Absolutist Thinking and Wellbeing

Using our more ecologically valid method for estimating absolutist thinking, we aim to establish links between an absolutist thinking style and wellbeing. Specifically, affective disorders (anxiety, depression and suicidal ideation) which we expect to correlate positively with absolutist thinking styles. This is largely based on the clinical practice literature where absolutist thinking is a recognised cognitive distortion in cognitive therapy (see Beck, 1991; Burns, 1989). Although recognised, it is rarely specifically examined, separate from the other facets of cognitive therapy. For instance, the Dysfunctional Attitudes Scale (DAS; Weissman, 1979) and the Attribution Style Questionnaire (ASQ; Peterson et al., 1982) are among the most widely used subjective measures questionnaires designed to estimate cognitive biases for affective disorder. While they both contain many items and responses which are relevant to absolutist thinking (e.g. *"If I fail partly, it is as bad as being a complete failure"*), they are not designed to specifically capture that construct. The few – and rather flawed –

measures designed to estimate dichotomous thinking have not been applied to depression and anxiety (e.g. the Dichotomous Thinking Inventory (DTI); Oshio, 2009). Absolute responding as measured by summing the number of end-point responses (usually on the DAS and ASQ measures) has been linked to depressive relapse by some studies (Peterson et al., 2007), but not others (Ching and Dobson, 2009). This methodology has serious shortcoming partly outlined by Forand and DeRubies (2014) and also in chapter 5 of this thesis. Finally, there have also been a few attempts to measure absolutist thinking using natural language. For example, articulated thoughts in simulated situations (ATSS) showed that depressed participants were deemed by coders to have used more dichotomous expressions in negative situations than non-depressed participants (White, Davidson, Haaga & White, 1992).

(4) Absolutist Thinking and Negativity

I intend to compare the relative association between an absolutist thinking style and wellbeing, with that of a negativistic thinking style and wellbeing. The association between negativity and well-being has long been established (Ehring & Watkins, 2008), indeed for many, the two concepts are almost synonymous. We intend to empirically demonstrate, that although less intuitive, absolutist thinking has an equally strong association with wellbeing to that of negativity. This taps into an emerging debate in the field of mental health. Namely, is affective disorder the result of content (negative thinking) or process (cognitive rigidity). For this reason, in many parts of the thesis, we will not discuss absolutist thinking in isolation, but compare it to negative thinking.

(5) Absolutist Thinking and Cognitive Rigidity

Finally, we will begin to demonstrate an association between absolutist thinking and cognitive rigidity. These two concepts are often assumed to be linked (Pollock & Williams, 1998), however there is little empirical evidence demonstrating the association. The link may be important in explaining the mechanism by which absolutist thinking could give rise to affective disorder.

Chapter One: Literature Review

1.1 Chapter Overview

The concept of absolutist thinking is not confined to any specific body of literature, rather, it spans large swathes of different disciplines. In line with the research questions set out in the introduction, the review will focus on absolutist thinking in the field of mental health, psychometric methods of measuring absolutist thinking and the debate between content (negativity) and process (flexibility). The structure of this literature review will be partly chronological, beginning with the cognitive revolution in the 1960's. Albert Ellis was one of the earliest to identify the maladaptive impact of absolutist thinking, as formulated in his psychotherapeutic practice 'Rational Emotive Behavioural Therapy' (REBT). REBT was shortly followed by 'Cognitive Therapy' (CT) devised by Aaron Beck, and was greatly influenced by Ellis' REBT. While focussing on absolutist thinking, we discuss the similarities, differences and empirical status of both therapy models. Arguing that while Ellis and REBT centred around combatting dogmatism, Beck and CT had a greater focus on negative thinking. We will then review the existing literature associating absolutist thinking with a number of mental health conditions, highlighting the lack of empirical studies connecting absolutist thinking to depression and anxiety. After reviewing the links between absolutism and mental health, we will briefly review the links between negativity and mental health, highlighting any shortcomings. This will be done in service of the larger debate on content vs. process, leading to the 'third wave' psychotherapies, which have emphasized process models of depression and affective disorder. Many of these

therapies (i.e. mindfulness) prioritize psychological flexibility, identifying absolutist categorical imperatives as antithetical to good mental health. This therefore leads to a brief review of the association between psychological flexibility and both absolutist thinking and affective disorder. This chapter ends with a detailed review of a seminal paper (Teasdale et al., 2001) which claims absolutist responding (on Likert type scale) is a cognitive vulnerability for depressive relapse. We also review and discuss the multiple subsequent replication attempts.

1.2 Absolutist Thinking and Rational Emotive Behavioural Therapy

Albert Ellis, a US clinical psychologist, founded the psychotherapeutic theory and practice of Rational Emotive Behavioural Therapy (REBT). In principle, the therapy is focused on challenging and disputing 'irrational' beliefs, which Ellis argues precipitate emotional disturbance. In practice, the term 'irrational' has proven difficult to define, it currently almost exclusively equates to some form of absolutist thinking.

This narrow definition of 'irrational' is a relatively recent development. For many years, REBT courted controversy by effectively claiming that all irrationality resulted in emotional disturbance. For instance, in a 1996 speech, Ellis stated that religion (which he deemed irrational) was "on almost every conceivable count, directly opposed to the goals of mental health".

While never fully abandoning the notion that all irrationality was mal-adaptive, Ellis did also outline 11 specific irrational beliefs. These were then reduced into 'four factors', which make up the 'four factor model' that currently defines the term 'irrational beliefs' within REBT. The first of these is referred to as 'demandingness', and it signifies beliefs which impose rigid and absolutist demands (e.g. "things must

be…", "I have to...", "she should have…"). Demandingness is also widely and humorously named '*must*-urbation', both terms were coined by Ellis, to emphasize the association with the obligatory modal word "must", in demanding that something *must* be a certain way. It should be noted that demandingness is simply an alternative term for categorical imperatives (as defined in the introduction). These lie at the core of REBT and are considered the primary irrational belief factor (Ellis, 1997).

The remaining three factors in the four-factor model are 'catastrophizing', 'low-frustration tolerance' and 'global evaluations'. These are somewhat self-explanatory, they refer to imagining catastrophes, a lack of resilience to stressors and overgeneralizing, respectively. Once again, it is argued that their maladaptive quality stems from their absolutistic nature. For example, catastrophizing is defined as "dichotomous evaluation of a negative event as worse than it absolutely should be" (Szntagotai & Jones, 2010). In this way, they are considered secondary irrational belief factors as, it is argued, they derive from the primary irrational belief factor demandingness (e.g. Ellis, 2003). Indeed, Ellis has previously argued that all irrationality ultimately has 'absolutism' at its core, reasoning that in the absence of rigid demands, an individual would be free to choose other beliefs, and consequently maladaptive beliefs would be abandoned. He went on to identify that the distinguishing feature between REBT and other psychotherapies, is its primary focus on "absolutistic, dogmatic shoulds, oughts, and musts", maintaining that it is the inclusion of this form of irrationality which converts "*appropriately* sad, regretful, disappointed and annoyed" into "*inappropriately* depressed and self-hating" (Ellis, 1987). While never explicitly stated, it is nevertheless clear from the REBT literature, that the terms demandingness and absolutist thinking are synonymous. For example,

Freeman (2006) writes “irrational or dysfunctional beliefs are absolutist evaluations or demandingness that past, present, or future life events should, ought or must be different from the way they are”. Crucially, this means that where REBT argues that demandingness is the primary irrational belief, and that it gives rise to all other irrational beliefs; in this thesis we argue that absolutism fits that role better.

Having only a single factor at its core (demandingness), has exposed REBT to criticism as an overly reductive therapy model. Detractors argue that a multitude of different thoughts (irrational or otherwise) contribute to emotional distress. This is evident in the psychopathology models of other psychotherapy disciplines, which almost always have a more complex multicomponent structure. REBT counters, that while emotional distress is proximally induced by a multitude of different thoughts, they are all ultimately fostered by rigid absolutist thinking (DiLorenzo, David & Montgomery, 2007). If this is so, it could be reasoned that even the REBT four-factor model is needlessly complex, and that just the single factor of demandingness (or rather absolutist thinking) would suffice. Supporting this notion, Muran, Kassinove and Dill (1992) conducted a semantic analysis of 16 linguistic variants hypothesised to represent the four irrational belief factors (Ellis & Dryden, 1987). They combined this with Likert type questionnaires and found that confirmatory factor analysis ‘generally failed’ to support the four-factor model. They conclude that only a single factor of irrationality existed.

REBT also outlines what it considers are rational beliefs; here the theory becomes more complicated. In one respect, rational beliefs simply appear to be the non-absolutist versions of irrational beliefs. They are therefore characterised as ‘preferences’ and ‘desires’ as opposed to the ‘needs’ and ‘demands’ (Ellis, David &

Lynn, 2010). However elsewhere, rational beliefs are also described as flexible, consistent with reality, logical and self-enhancing (Dryden, 2005; Szentagotai & Jones, 2010). This is a much broader conceptualisation, with only the first of these attributes actually directly linked to demandingness, or indeed, absolutist thinking. This is consistent with the claim made by some REBT practitioner/researchers, that rational and irrational beliefs are orthogonal. This means the absence of irrationality, is not in itself the presence of rationality (David & Szentagotai, 2006).

In summary, the central goal of REBT is to combat absolutistic categorical imperatives termed 'demandingness'. While other psychotherapy models also recognise the maladaptive impact of absolutist thinking, only REBT recognises it as the sole core and source of downstream maladaptive cognitions.

1.3 Rational Emotive Behavioural Therapy & Cognitive Behavioural Therapy

1.3.1 The Founding

In many ways, REBT pioneered cognitive based therapies. Founded in the mid-1950's, at the height of the cognitive revolution, it placed psychotherapy on a cognitive path, and away from Freudian psychoanalysis and behaviourism. It preceded its more influential offshoot 'Cognitive Therapy' (CT) by almost a decade. Founded by Aaron Beck in the 1960's, CT quickly gained prominence and overtook REBT as the leading cognitive behavioural therapy. For this reason, it is Beck and not Ellis, who is credited as the "father of cognitive behavioural therapies" (e.g. Halter, Rolin-Kenny & Dzurec, 2013). Cognitive behavioural therapy (CBT) is the umbrella term which encompasses

REBT, CT and numerous other cognitive based therapies. However, due to the predominance of Beck's ideas and formulation, the terms CT and CBT are mostly interchangeable.

Recently, there has been a growing consensus among REBT practitioners that there is no meaningful difference between the two therapy models. David (2014) writes that "REBT is CBT", and the Albert Ellis institute now refers to its psychotherapy as "RE & CBT". It's difficult to determine whether this was merely an attempt to elevate the status of REBT by associating it more closely with CBT, or a sincere recognition of the similarities between REBT and CBT. Nevertheless, while there are certainly similarities, there are also substantial and consequential differences.

1.3.2 The Differences

Beck (1972) proposed several 'cognitive manifestations', these were akin to irrational beliefs in that they were various maladaptive cognitive appraisals. None of them however explicitly invoked any kind of absolutist thinking. Later Burns (1989) converted these manifestations into what today are recognised as the 'cognitive distortions' of CBT. They are 'all-or-nothing thinking', 'overgeneralization', 'mental filter' (negative), 'discounting the positives', 'jumping to conclusions', 'magnification or minimisation', 'emotional reasoning', 'should statements', 'global labelling', 'personalisation & blaming', 'always being right' and the 'fallacy of fairness'. This list is not exhaustive, yet many of the distortions do indeed relate directly with the irrational beliefs of REBT. They are however far less focused on absolutist thinking as the core dysfunctional distortion. While they recognize the maladaptive impact of all-or-nothing thinking, it is viewed as merely one distortion among many, and no

hierarchical model is proposed. Ellis (1987) addressed this point, proposing that REBT uniquely recognizes the role of categorical imperatives (demandingness) in the development of depression. In rebuttal, Brown and Beck (1988) argue that Ellis has ignored the presence of categorical imperatives in other forms of psychotherapy (i.e. CBT), refuting the notion that REBT 'stands alone' in this respect. It should be noted that this exchange occurred in 1987-88, one year before Burns (1989) published the 'cognitive distortions' which recognized the role of absolutist categorical imperatives. At the time of writing, Ellis was right to point out that although there may have been mention of categorical imperative in other psychological disciplines, only REBT had recognised them as the core maladaptive belief.

A difference in the prominence of absolutist thinking as a maladaptive force, is not the most consequential difference. The sharpest distinction between REBT and CBT relates to their respective views on negative thinking. Beck introduced into CBT the concept of the 'negative triad'. This refers to the tendency in depressed individuals to have negative views about themselves, the world, and the future. This pessimistic style is suggested as a possible mediator or vulnerability factor for depression. The negative triad is an intrinsic part of CBT theory and practice, even the cognitive distortions are to be understood from the perspective of a negative interpretive bias. For example, overgeneralising would manifest itself as overgeneralising negatively, rather than simply overgeneralising in general (e.g. Thomas & Duke, 2007). Interestingly, and in sharp contrast, the REBT literature makes almost no mention of positive or negative thinking. Indeed, REBT practitioners explicitly clarify that as neither positive nor negative thinking is necessarily rational or irrational, the terms are not used (see David, 2010). REBT is almost singular in this

respect; nearly all other psychotherapy models and practices designate some maladaptive role to negative thinking. This sets up a long standing, and largely unspoken division, between process models for depression and content models for depression. While most psychotherapies deal with a mixture (i.e. CBT), allowing practitioners to give different weightings to the process and content components of the psychotherapy model. REBT strictly focusses on maladaptive processes and does not have a maladaptive content component.

Beyond theory, there are also practical differences largely established by the radically different therapy styles of the founders. Ellis believed that since irrational thoughts are held forcefully, a therapist must be equally forceful in challenging and disputing them (see Ellis & Harper, 1975; Alexander, 2018). Conversely, the more congenial Beck preferred a gentler 'listening' approach, where patients are 'guided' towards more adaptive thinking (see Turkcapar, Kahraman, Sargin, 2015). Finally, there is also a major difference in the empirical status of REBT and CBT.

1.3.3 The Empirical Status

There is an extremely large and still growing body of empirical evidence supporting the efficacy of cognitive behavioural therapy (e.g. Butler, Chapman, Forman & Beck, 2005). CBT has been empirically driven from its outset, and this contributed its rapid rise in popularity. Most studies have been clinical randomized control trials, in which the efficacy of CBT was compared with a range of other control and/or treatment groups (e.g. Beck & Fernandez, 1998; Gloaguen et, al. 1998; Rector & Beck, 2001). Many reviews of meta-analyses have been conducted (see Hofmann, Asnaani, Vonk, Sawyer & Fang, 2012; Sztein, Koransky, Fegan & Himelhoch, 2017), collectively their

findings indicate that CBT is highly effective for depression and anxiety, as well as a range of other emotional disorders.

Sadly, the empirical status of REBT is not nearly as robust. As Kendal et. al., (1995) points out, REBT has been dogged by ambiguities in the theory, remedial flaws in the design of studies and a lack of large scale randomized control clinical trials. Unlike CBT, for many years REBT practitioners did not recognize the value in hypothesis testing their clinical observations and practices. REBT is not empirically driven, rather, many of its tenets are clinically derived. In one of the few meta-analyses conducted into REBT studies, MacInnes (2004) examined (1) the association between irrational beliefs and affective disorder and (2) the assertion that demandingness is the core irrational belief. They found 18 studies which met their requirements, 6 were non-experimental survey studies; 9 were case-control cross-sectional intervention studies, 1 was a prospective study and 3 specifically looked at the claim that demandingness is the core irrational belief. They found the strength of the association between irrational beliefs and dysfunctional emotions to be small. They also found no evidence for demandingness as the core irrational belief. They concluded that the evidence does not support the theories of REBT. This conclusion is disputed by David, Szentagotai, Eva & Macavei (2005). While they concede that more quality research is needed, they argue that 'hundreds of research articles' support REBT's main basic theory and efficacy. They acknowledge that the formulation of demandingness as the core irrational belief is based on Ellis' clinical work and that there is no empirical evidence to support this theory.

It is true that other larger meta-analyses have endorsed the efficacy of REBT. For example, Lyons & Woods (1991) included 70 REBT studies with 236 comparisons

into their meta-analysis. REBT was compared with baseline, control group, cognitive behaviour modification, behaviour therapy and various other interventions. It was found to produce a significant improvement over baseline and control, but not significantly different from cognitive behaviour modification and other psychotherapy methods examined. Effect sizes correlated with therapist experience and the length of treatments; there was no difference between psychotherapy clients and students as subjects. Interestingly, the studies that were rated highly in with respect to internal validity (random assignment, low attrition, and outcome measures low in reactivity) had significantly higher effect sizes than the medium validity studies. The authors also highlight methodological flaws, including a lack of follow up data and information on attrition rates. Later, Engles, Garnefski & Diekstra, (1993) also conducted a meta-analysis of 28 controlled REBT studies, finding it was superior to placebo and equal to other combination therapies (including CBT) and systematic desensitization.

Overall, there appears to be empirical support for the efficacy of both REBT and CBT (although this is more comprehensive for CBT). It is however unclear what factor(s) are mediating the positive outcomes. As absolutist irrational beliefs (and cognitive distortions) are often correlated with negative thinking, it is difficult to parse out their respective contributions to dysfunctional mental health.

1.4 Absolutist Thinking and Emotional Disorders

I will situate this review of absolutist thinking and emotional disorders within the context of appraisal theories of emotion. All the irrational beliefs and cognitive disorders previously discussed are appraisals, in that they are “evaluations” made about the self or environment (Yap & Tong, 2009). Such appraisals are believed to

elicit emotions (Scherer, Schorr & Johnstone, 2001), especially where they relate to goals and resources.

1.4.1 Absolutist Thinking and Suicidal Ideation

Neuringer (1961; 1964) was among the first to identify the propensity for dichotomous thinking in suicidal ideation. He observed that patients that had previously attempted suicide (and were currently hospitalized) made more extreme value judgements and 'made greater differences among opposing concepts' than did controls. This led to the conclusion that "dichotomous evaluative thinking seems to be a common characteristic of emotionally disturbed persons". This was deduced from 'semantic differential tests' where patients were asked to make ratings on a seven-point Likert scale. Although these are technically appraisals, in that they are evaluations, they lack the ecological validity of irrational beliefs or cognitive distortions as expressed in natural language. Using the same methodology of extreme responding on Likert scales, Smith (1993) corroborated these findings by concluding that extreme ratings, both positive and negative, were linked to suicidal ideation.

Later, cognitive rigidity was also associated with suicidal ideation. Patsiokas, Clum and Luscomb (1979) administered the 'embedded figures test', 'alternative uses test' and the 'matching familiar figures test' and found that the suicide attempter group displayed significantly greater rigidity in a divergent thinking task and greater difficulty in generating alternative solutions. This finding was endorsed by Keilp et al., (2001), who found executive function deficits in suicidal patients after running a battery of neuropsychological tests. They argue that cognitive flexibility is the critical factor differentiating high vs. low lethality suicide attempters. In another compelling

study, Marzuk, Hartwell, Leon and Portera (2005) hypothesised that suicidal subjects would perform more poorly on measures of executive functioning and mental flexibility, than non-suicidal depressed subjects. They tested this using standardized measures for executive functioning, mental flexibility, problem solving and ability to generate multiple solutions. For example, these included the Wisconsin Card Sorting Test (WCST), where participants must deduce the correct way to match cards. They found that suicidal patients performed significantly worse on these measures. Their findings were controlled for age, IQ, severity of depression and number of prior suicidal attempts. This suggests that an absolutist and rigid perspective, is a distinguishing factor between depression and suicidal ideation. It is generally understood that the cognitive rigidity observed in suicidal individuals is associated with the dichotomous thinking also observed in suicidal individuals (Ellis & Rutherford, 2008). Interestingly, Marzuk, Hartwell, Leon and Portera (2005) theorize that dichotomous thinking stems from cognitive rigidity. This is counter to the ideas of REBT which postulate that cognitive rigidity is derived from absolutist irrational beliefs, such as dichotomous thinking (Turner, 2016).

In a critical review of this emerging literature, Arffa (1983) writes "cognitive–rigidity (whether it is termed dogmatism, dichotomizing, hopelessness, or whatever) is patently implicated in suicide". Hopelessness has repeatedly been found to be the most reliable feature in suicidal ideation (e.g. Minkoff, Bergman, and Beck, 1973; Steer, Kumar, & Beck, 1993; Beck, Brown, & Steer, 1989; Stewart et al., 2005; Thompson, Mazza, Herting, Randell, & Eggert, 2005). Many have linked hopelessness to both dichotomous thinking and cognitive rigidity (Weishaar & Beck, 1992). Indeed, a state of hopelessness is commonly characterised as absolutist, inflexible and

insensitive to new or conflicting information. Hopelessness however, is also clearly negatively valenced; in this way it differs from dichotomous thinking and cognitive rigidity, which in principal have no valence. Finally, suicidal ideation has also been linked with poor problem-solving skills. This is also believed to be linked to cognitive rigidity and dichotomous thinking (Ellis & Rutherford, 2008). For example, Schotte and Clum (1982), tested 65 undergraduate students that self-reported suicidal ideation on the 'scale for suicidal ideators'. They looked at negative life stress, cognitive rigidity, poor problem-solving skills, hopelessness and suicidal ideation. They predicted that a deficit in the capacity for divergent thinking would lead to a 'cognitive unpreparedness' to cope with the high levels of life stress, which would produce a state of hopelessness. The authors administered a battery of tests which include 'Self-rating Depression Scale', 'Life Experiences Survey' and 'Hopelessness Scale'. While they found no relationship between cognitive rigidity and suicidal ideation, they did find poorer problem-solving skills among those with suicidal intent. In fact, suicidal subjects were only able to provide half as many potential solutions as non-suicidal patients.

In a series of studies, Pollock and Williams have investigated the problem-solving capacity of suicidal individuals. They hypothesized that problem-solving deficits are linked to greater cognitive rigidity and dichotomous thinking (Pollock & Williams, 1998). They also argued that dichotomous thinking, cognitive rigidity and problem-solving deficits all lead to a state of hopelessness. In an intervention study, they taught suicidal individuals how to be flexible with respect to new and future goals and the outcomes. The results revealed that the intervention group showed significantly better overall results in identifying problems, arranging priorities and

generating a wide range of solutions compared with the control group. This work was extended (Pollock & Williams, 2001) to reveal that suicide attempters were more over-general in autobiographical memory and displayed poorer problem solving than the control group. Finally, Pollock and Williams (2004) found suicidal individuals to be passive problem solvers, not able to spontaneously generate alternative solutions. Their work has been endorsed by Bartfai, WinBorg, Nordstrom & Asberg (1990), who found suicidal inpatients had a decreased ability to generate new ideas when no alternatives are provided.

The work reviewed so far has mostly relied on questionnaires, executive functioning tasks and extreme responding on Likert type scales. These methods are less than ideal in studying irrational beliefs/ cognitive distortions, in the context of appraisal theory. Because appraisals are more naturally expressed in natural language, an ecologically valid study would examine natural language. In one such study, Litinsky & Haslam (1998) applied the 'thematic apperception test' (TAT) to verbal productions to refine the concept of dichotomous thinking. Patients and controls were both asked to interpret ambiguous pictures. The scoring system was based on instances of complete polarity in the narrative, "two coders demonstrated high levels of agreement". Results showed that there were more than twice as many instances of complete polarity from the suicidal ideation group relative to the control group. Specifically, they found that suicidal patients had a significantly elevated rate of narrowly defined dichotomous thinking, "involving diametric or polarized possibilities". Interestingly, there was no difference with respect to 'weaker forms' of dichotomous thinking, which involved non-binary extremes. They also found that suicidal patients produced shorter TAT narratives, supporting the hypothesis that they

were cognitively and affectively "shutdown". In another example of natural language analysis, Wedding (2000) identified salient examples of dichotomous thinking in the confessional poetry of the late Anne Sexton. Anne Sexton, suffered from severe mental ill-health, and eventually committed suicide via carbon monoxide poisoning.

In summary, dichotomous thinking, cognitive rigidity and problem-solving deficits have been found to be strongly correlated with each other, as well as with hopelessness and suicidal intent. While the specific nature of the associations remains to be established, it is believed that a binary and rigid outlook hinders problem solving skills and characterizes a state of hopelessness which is ubiquitous among suicidal individuals.

1.4.2 Absolutist thinking and Borderline Personality Disorder

In their seminal paper on the subject, Veen and Arntz (2000) were among the first to empirically associate Borderline Personality Disorder (BPD) with dichotomous thinking. They tested a BPD group (n=16), a control cluster C personality disorder group (n=12) and a no disorder control group (n=15). Participants were shown 10-minute film clips portraying positive and negative situations, some of the negative situation specifically targeted common BPD concerns (i.e. mistreatment of children). Participants were requested to evaluate 6 characters, on a structured response format. They were asked about a number of bipolar trait descriptions (i.e. honest or dishonest etc.), presented on visual analogue scales. The extent of dichotomous thinking among the individuals tested was inferred from extremity of their responses on these scales. Importantly, these were fully continuous analogue scales, rather than Likert. The BPD group was found to make more extreme response for both positive

and negative characters, but there was no difference for neutral characters. The authors note that these extreme responses were 'multidimensional' – in that BPD participants did not rate characters as "all good" or "all bad"; but rather, absolutely good in some respects and absolutely bad in others. In this way, the authors distinguish between unidimensional and multidimensional dichotomous thinking. The key methodological problem with this study relates to its ecological validity. The stimuli were not personally relevant to participants (famous film clips) and their responses are structured and not expressed through the more natural medium of natural language.

Using the same sample and similar methodology, Arntz and Veen (2001) conducted a follow-on study, in which they collected written spontaneous reactions instead of visual analogue responses. These were independently coded on two dimensions; 'affect/tone' and complexity of the evaluation. They found that the BPD group and cluster C personality disorder group, both demonstrated "poorly differentiated evaluations". Although somewhat limited, this finding supports their earlier work and utilizes a more ecologically valid method (natural language). As with their previous study, the findings are reliant on a small number of observations in each group (N = 12-16), so such results should be treated with caution.

Arntz and Haaf (2012) investigated whether BPD individuals (n=18) have a less complex understanding of others compared with controls (cluster C personality disorder, n=18; and no disorder, n=18), comparing the relative contribution of dichotomous thinking and negative thinking. Participants discussed problems with three mental health trainees. Each trainee occupied a different role: rejecting, accepting and neutral. Participants were asked to evaluate trainees in a structured

response format (visual analogue scale) and a semi-structured interview. The interviews were scored by independent raters on affect/tone, differentiation and complexity of attributions. In all conditions and all formats, the BPD group displayed more dichotomous thinking. More negativity in BPD was only found in the structured responses of the rejecting condition. The authors therefore concluded that dichotomous thinking, more than negativity, is central to the interpretation of others by BPD patients.

This finding was corroborated by Moritz et al., (2011). They found that on a range of standard neuropsychological tests, BPD patients (n=20) performed similarly to controls (n=20), except that the BDP patients showed greater use of a one-sided attribution style.

Finally, Napolitano and Mckay (2007), conducted a replication study of Veen and Arntz (2000), using the same methodology and sample groups. They were specifically interested in tested the latter's finding that BPD patients displayed multidimensional dichotomous thinking. In support of Veen and Arntz (2000), they found that the BPD group (n=16) made more dichotomous evaluations than controls. Consistent with the multidimensional hypothesis, BPD evaluations reflected a mixture of positive and negative attributes. They also found that dichotomous thinking was not solely confined to negative stimuli, but was also evident in response to nonspecific and emotionally positive stimuli.

Other studies have resulted in slightly different conclusions. Sieswerda, Arntz and Wolfis (2005) investigated whether BPD patients also made more extreme judgements in non-interpersonal situations. Participants were asked to play computer games, some designed to be rewarding and others frustrating, after which participants

evaluated themselves and the games. The BPD group (n=24) made more extreme evaluations about the game than controls (n=25), cluster C personality disorder (n=10) and antisocial personality disorder (n=16). Nevertheless, the authors conclude that BPD was actually characterized more by negativity than by dichotomous thinking.

Similarly, Sieswerda, Barnow, Verheul and Arntz (2013) also investigated whether dichotomous and or negative thinking in BPD patients is limited to interpersonal situations. Once again participants were asked to rate characters in film clips on visual analogue scales, across a range of valence conditions. Here, no evidence was found for dichotomous thinking in the BPD group. The BPD group (n=18) did however make more negativistic responses when compared to the cluster C personality disorder group (n=16) and no disorder controls (n=17).

It is difficult to determine the source of the discrepancy in these findings, especially as the methodologies are often very similar, and in many instances the same authors reported different results. The most plausible rationalisation centres around sample size; most studies have fewer than 20 subjects in each group (especially those that failed to reject the null). It may therefore be that they were underpowered.

1.4.3 Absolutist thinking and Eating Disorders

1.4.3.1 Anorexia Nervosa and Bulimia Nervosa

Apart from suicidal ideation and BPD, absolutist thinking is most commonly connected with eating disorders. Here, we review its association with anorexia nervosa and bulimia nervosa.

On the treatment of patients with anorexia nervosa, Garner, Garfinkel and

Bemis (1982) write that the “anorexic patients often think in absolute terms”. They go on to observe that in anorexia nervosa, rigid absolutist thinking is not limited to weight or interpersonal issues, rather, “careers, studying and sports are also pursued fanatically”. They suggest that this dichotomous thinking tendency is trait-like, and linked to a need for certainty and control. Their findings appear to be primarily derived from clinical observations rather than experimental results. For instance, they cite the vacillation between over-compliance and stubbornness as evidence of a dichotomous cognitive style.

A cognitive factor often associated with eating disorders and absolutist thinking is perfectionism. Lethbridge, Watson, Egan, Street and Nathan (2011) empirically validate this link. They hypothesised that perfectionism serves as a maintaining mechanism for eating disorder psychopathology. They also argue that perfectionism leads to dichotomous thinking. Their sample included women with DSM-IV eating disorders (N= 238) and women in the general community (N= 248). They found that in a hierarchical regression analysis predicting for eating disorder psychopathology, dichotomous thinking significantly improved model fit beyond perfectionism alone. This was the case for both groups and reveals that dichotomous thinking explains some of the variation in eating disorder psychopathology, over and above perfectionism. Fairburn, Cooper and Shafran (2003) also contend that clinical perfectionism is a maintaining mechanism in bulimia nervosa and anorexia nervosa. They advocate its addition to CBT for eating disorders, however their recommendation also appears to be based mostly on clinical observations. Their view is however endorsed by Mitzman, Slade and Dewey (1994) who have developed an instrument to measure “neurotic perfectionism” and eating disorders.

Zotter and Crowther (1991) investigated various cognitive characteristics among 15 bulimic patients, 15 'repetitive dieters', and 15 non-bulimic and non-dieting controls. They used thought sampling procedures which were independently rated on content, affective tone, accuracy and adherence to a dichotomous thinking style. They found that bulimics reported significantly more dichotomous and distorted weight-related thoughts than either of the other groups. This finding was supported by Thompson, Berg and Shatford (1987), who examined 19 women who fulfilled DSM-III diagnostic criteria for bulimia, 35 women who were symptom free and 41 women who fulfilled some of the bulimic criteria. All three groups differed in dichotomous thinking, in line with their intensity of bulimic symptoms. The bulimic and bulimic-like group also displayed greater perfectionism than the non-bulimic control group.

Feixas et al., (2010) hypothesized and found that bulimia nervosa patients displayed greater discrepancies between imagined self and ideal self (self-discrepancy), higher polarization and greater cognitive rigidity. Their work was based on a sample of 64 women (50% bulimic, 50% control).

Finally, Johnson and Holloway (1988), examined conceptual simplicity and high level of 'obsessionality' in bulimia nervosa patients. They examined 54 college women, using structured interviews and the eating attitudes test. Results indicated that participants with higher bulimic scores exhibited significantly lower levels of conceptual functioning and significantly higher levels of obsessional traits. The conceptual simplicity they refer to means that women with obsessional traits are less able to add complexity and nuance to their conceptual thinking. While not necessarily absolutist, this deficit of nuance relates to absolutist thinking.

Overall, studies have repeatedly found associations between anorexia nervosa

and bulimia nervosa, and absolutist perfectionism and dichotomous thinking. The absolutism here appears to be particularly self-focused and connected with a misguided sense of attaining control.

1.4.3.2 Obesity

Most studies relating to obesity and absolutist thinking have identified it as a factor in hindering sustained weight loss.

In developing the 'Dichotomous thinking in eating disorder scale' (DTEDS), Byrne, Allen, Dove, Watt and Nathan (2008) tested a sample of treatment seeking eating disorder (N=87) and overweight/obese (N=111) women. They found that DTEDS captures both eating specific and more general dichotomous thinking. The DTEDS was developed to measure "rigid, black and white cognitive thinking" in weight gain and obesity.

This measure was used by Dove, Byrne and Bruce (2009) to test whether dichotomous thinking moderates the association between depression and body mass. Interestingly, in those with low dichotomous thinking, it was found that depression positively correlated with BMI. However, in those with high dichotomous thinking there was no relationship. The authors contend that this is because females in the high dichotomous group, who view their weight as unacceptably high, may experience high levels of depression irrespective of their actual weight, while those who are less dichotomous, are distressed proportionate to the degree of their obesity. This is consistent with the notion that absolutist thinking is independent of context.

Recently, Antoniou, Bongers and Jansen (2016) also used the DTEDS to find that dichotomous thinking, emotional eating, BMI and depression are all positively

correlated with one another. They also found that dichotomous thinking and emotional eating may mediate depression. This was supported by Ramacciotti, et al., (2008), who found the same connection through the use of subjective measures questionnaires. The DTEDS was also used by Palascha, van Kleef and van Trijp (2015) in a web-based survey of 241 adults. They found that eating specific dichotomous thinking "mediates the association between restraint and weight gain".

In two separate reviews of the literature Ohsiek and Williams (2010) and Williams (2011) found that avoiding absolutist dichotomous thinking is critical to weight loss maintenance. This is consistent with Byrne, Cooper and Fairburn (2003), who reported that among the psychological factors most strongly associated with maintaining successful weight loss is dichotomous thinking. Likewise, in a later prospective study the same authors identified dichotomous thinking as the best cognitive predictor of weight regain (Byrne, Cooper & Fairburn, 2004). Moreover, using qualitative data, Seamoore, Buckroyd and Stott (2006), found that in thematically analysed interviews, a reduction in dichotomous thinking was associated with reduced binge eating. Finally, mindfulness-based intervention, designed to engender greater flexibility among those with problematic eating behaviour; found decreases in food cravings, dichotomous thinking, body image concern, emotional eating and external eating (Alberts, Thewissen & Raes, 2012)

Overall, the evidence consistently finds that greater dichotomous thinking is associated with obesity, depression due to obesity and weight regain. Prospective studies, find that greater dichotomous thinking strongly predicts future weight regain. For both anoxia/bulimia nervosa and obesity, there appears to be strong consensus in

the literature. This may be because most of the studies conducted in this field have large sample sizes and follow established clinical designs.

1.4.4 Absolutist thinking and other maladaptive consequences

1.4.4.1 Teaching

There have been a few studies conducted on the impact of absolutist thinking in the teaching profession. For example, Ostell (1999) investigated the relationship between absolutist thinking with coping behaviour and health in a cohort of head teachers. Head teachers were assessed on the way they handled work problems, with either successful or unsuccessful outcomes. Some were classified as absolutist (N=49) and others as non-absolutist (N=31). Ostell found that head teachers deemed absolutist "experienced their job demands as less pleasant and perceived themselves to be less effective at managing their emotions for both problems; they perceived themselves as producing less 'successful' outcomes for the successful problem, as handling this problem less effectively, and as having poorer psychological and physical health.". In a separate study, Evers, Tomic, and Brouwers (2005) examined the causes of 'burnout' among secondary school teachers. They found dichotomous thinking to be a significant predictor of teacher burnout. They add that dichotomous thinking provided no practical benefit to the teaching of pupils.

1.4.4.2 Substance abuse

Several articles have also linked absolutist thinking with substance abuse issues. Most notably, in a paper entitled "Absolutist thinking and alcoholism", Wormer (1988) contends that alcoholics are characterized by an absolutist thinking style. Her thesis

was based predominantly on clinical observations and case studies. For example, Wormer recalls an AA meeting where one client said, "What's the point of drinking, if you're not going to get completely, 100 percent drunk?" she relates that this sentiment was shared by all others in the room. Wormer goes on to argue that absolutism mediates alcoholism in two ways; (1) the all-or-nothing attitude mandates excess, (2) it compromises individuals coping mechanisms, they then resort to alcohol, which further compromises their coping mechanism. Remaining intellectually consistent, Wormer is also critical of absolute abstinence. Citing that the Mormon religion forbids the consumption of mind altering substances, and consequently alcohol consumption is low among Mormons, paradoxically, alcoholism is high. This is indeed the case, although the state of Utah – where 60% of the residents are Mormons – has the lowest levels of alcohol consumption and binge drinking in the US, they also have the 7th highest levels of alcohol poisoning deaths according to the US National Vital Statistics System 2010-2012 records (Canham, 2015). This implies that an all-or-nothing view of alcohol is engendered in Mormon culture, therefore where consumption occurs, it more readily leads to alcoholism. Wormers clinical observations have received support from Ammerman, Lynch, Donovan, Martin and Maisto (2001). They investigated 551 adolescents, using the 'Constructive Thinking Inventory' and its clinical correlates. They found that categorical thinking distinguished adolescents with substance use disorder from those without substance use disorder. Categorical thinking with two categories is essentially dichotomous thinking, and with more categories, it is an extension of dichotomous thinking. Essentially, it drastically simplifies the world in a way that is prone to absolutism.

Finally, in conducting a confirmatory factor analysis on the 'Addiction Belief Scale', Schaler (2009) confirmed the presence of a dichotomous thinking subscale.

1.4.4.3 Personality Disorder

There has been little research into absolutist thinking and personality disorders. The first connection was made by Eysenck (1947) who argued that introverted neurotics where behaviourally rigid. He subsequently attempted to clarify the term rigid as distinct from dogmatic (1960), claiming that rigidity is the inability to generate novel responses, while dogmatic individuals refused to use novel responses, although they could generate them. Later, Watson (1967) corroborated this claim by finding no difference between neurotics and non-neurotics in their ability to produce novel responses, only neurotics generally failed to utilize such responses. Secondly, this behaviour was limited to introverted (not extroverted) neurotics; consistent with Eysenck (1947). More recently, Oshio (2009) developed the dichotomous thinking inventory, a self-report measure of 'preference for dichotomy', 'dichotomous beliefs' and 'profit and loss thinking'. Oshio, (2012) found the dichotomous beliefs subscale, significantly correlated with all cluster A, B and C personality disorders. Given the strength of this finding, it is strange that very little research has been done subsequently on this topic.

1.4.4.4 Perfectionism

A large body of literature has examined perfectionism and its consequences. However, there is an ongoing debate into what constitutes perfectionism. Hewitt and Flett (1991) conducted some of the earliest work on this topic. They developed the

"Multidimensional Perfection Scale", an influential measure in the field. The scale is composed of three separate subscales; 'self-oriented perfectionism', 'other-oriented perfectionism', and 'socially prescribed perfectionism'. This instrument has repeatedly shown links between perfectionism (and its subscales) with eating disorders, depression, anxiety, rumination and other types of psychological distress (Hewitt & Flett, 1991; Hewitt & Flett, 1993; Hewitt, Ediger & Flett, 1996; Flett, Besser, Hewitt & Davis, 2007; Nepon, Flett, Molnar & Hewitt, 2011; Flett, Galfi-Pechenkov, Molnar, Hewitt & Goldstein, 2011). In a review of the literature, Shafran and Mansell (2001), conclude that the current measure of perfectionism (the Multidimensional Perfection Scale), does not reflect the original construct. They contend that perfectionism is the holding of "excessively high personal standards and rigid adherence to them". They maintain that the inclusion of 'other-oriented perfectionism', and 'socially prescribed perfectionism' confounds 'associated variables' with the definition of perfectionism.

The confusion regarding the proper definition continues with the proposition of "positive perfectionism" and "negative perfectionism". For example, Andrews, Burns and Dueling (2004), find that positive perfectionism is related to optimism and conscientiousness, while negative perfectionism is related to pessimism and neuroticism. A closer inspection clarifies how they make this distinction between positive and negative perfectionism. While negative perfectionism describes those who strive for perfection, positive perfectionism is simply holding non-absolutist high standards. As the authors explain "normal perfectionism, where the individual is able to set high goals and standards…when the situation changes, individuals have the ability to modify their previous standards". It is needlessly confusing to term high

standards as perfectionism; the essence of perfectionism is its absolutist nature. Simply holding non-absolutist high standards could be more accurately described as "not perfectionism" than "positive perfectionism". This is evident in the work of Egan, Piek, Dyck and Rees (2007), who found dichotomous thinking as the variable most predictive of "negative perfectionism" and was not connected with "positive perfectionism".

1.4.4.5 Absolutist thinking and Depression

As outlined, there is a wealth of literature associating absolutist thinking with suicidal ideation, borderline personality disorder, eating disorders and various other maladaptive consequences. Strangely, empirical studies directly linking depression with absolutist thinking are few and far between. This is particularly curious as both dichotomous thinking and categorical imperatives are readily recognised as vulnerability factors for depression and anxiety by the clinical field (i.e. within REBT and CBT). There is, as has already been reviewed, empirical evidence to support the clinical efficacy of CBT and REBT. While it might be reasonable to assume that in the case of REBT, the benefits are due in large part to combatting absolutist thinking, due to the central role that demandingness plays in the therapy model, no such assumption can be attempted for the more prevalent CBT, which has many other possible mediators.

There have been a small number of studies that have linked dichotomous thinking with bipolar depression. For example, Dodd, Mansell, Morrison and Tai (2011) found that extreme, personalized, positive and negative appraisals were associated with bipolar symptomatology. This is consistent with the positive and

negative mood swings which characterize bipolar depression. Additionally, Kelly et al., (2011) examined a sample of bipolar disorder (N =171), unipolar depression (N =42) and controls (N = 64). They found extreme positive appraisals only related to a greater probability of bipolar disorder if extreme negative appraisals were also high. Individuals were most likely to have bipolar disorder, as opposed to unipolar depression or control when appraisals were both extremely positive and negative.

There have been a series of studies which suggest that a greater tendency for making absolute end-point responses on Likert scales is a cognitive vulnerability for depression. These will be examined in detail later in this chapter, however an overview is relevant here. These studies started with Teasdale et al., (2001), who found that on the ASQ and DAS subjective measures questionnaires, extreme responses (ER; both positive and negative) were the best predictor for depressive relapse. They argued, that the ER reflect and extreme absolutist thinking style, and that this was a cognitive vulnerability for depression. Subsequently, using the same measures, a number of studies have attempted to replicate these findings. Most have only produced partial replications with qualified results. Beevers, Miller, Keitner & Ryan (2003) found that ER did not decrease with decreasing depression symptoms, and only the ER change score (taken at the start and end of treatment) predicted relapse, not the absolute levels. Peterson et al., (2007) did find that ER predicted acute phase outcomes, and non-responders to treatment had greater ER scores, however ER was not predictive in the continuation phase. De Graaf, Huibers, Cuijpers & Arntz (2010) found that ER increased across categories of depression (mild -> major), however while negative ER increases from mild to major, positive ER was found to show the opposite association. Strange et al., (2013) showed that more ER

was retrospectively associated with more lifetime episodes of depression. Forand and DeRubies (2014) found that no ER variable predicted depressive relapse, however they raised serious criticism of this methodology, pointing out that the content of the items compromises whether or not an extreme response is actually extreme/irrational. That is, an extreme response to a moderate item should not be combined with an extreme response to an extreme item. When accounting for this with a style vs content indexed, they found ER did significantly predict relapse. The methodological flaws they identify may explain why Ching and Dobson (2009) and Jacobs et al., (2010) both failed to find a link between ER and depression or relapse.

There have also been a few attempts to measure absolutist thinking using natural language. For example, articulated thoughts in simulated situations (ATSS) showed that depressed participants were deemed by coders to have used more dichotomous expressions in negative situations than non-depressed participants (White, Davidson, Haaga & White, 1992). Later, Fekete (2002) used an adapted Weintraub text analysis method on four Internet forums (suicide, depression, anxiety, and a journalism control). They found significant results for 13 language variables including negations and dichotomous expressions. Finally, Cohen (2012) measured "cognitive rigidity" in the "spontaneous autobiographical narratives" of undergraduate students and found correlations with negative emotionality. Unlike structured response formats and ER, these natural language text analysis studies have more ecological validity.

1.4.4.6 Absolutist thinking and Anxiety

As with depression, there is an even greater lack of empirical studies directly linking

absolutist thinking with anxiety. Once again, clinical models for anxiety include absolutist thinking as a vulnerability factor (Williams and Garland, 2002), however other than empirical evidence for the efficacy for REBT and CBT in anxiety, there has been little research conducted. Perfectionism, is the closest construct to absolutist thinking empirically linked to anxiety in the literature (Frost & DiBartolo, 2002). To the best of my knowledge no study has specifically linked dichotomous thinking or categorical imperatives with anxiety.

1.5 Negative Content vs. Dysfunctional Processes

1.5.1 What is mediating positive outcomes?

As already outlined, there is a large body of empirical data supporting the efficacy of CBT. It is difficult to determine however, which aspects of CBT mediate improved emotional outcomes in those that undergo the therapy. It may be that a reduction in depressive symptoms is brought about by addressing the negative interpretive bias. This involves reducing negative thinking and restructuring negative schemas in a patient's cognitive architecture, resulting in a less pessimistic outlook. Alternatively, it may be that a reduction in depressive symptoms is brought about by challenging cognitive distortions like all-or-nothing thinking. Specifically, this would increase appraisal flexibility, either positive or negative, by countering absolutism. Most practitioners would venture that a combination of both reduced negative thinking and increased flexibility are needed to bring about positive clinical outcomes for depression. Yet, studies which have addressed this topic have struggled to parse the content-focussed (i.e. negative thinking) and process-focussed (i.e. flexibility) aspects of cognitive therapies.

This division has already been discussed with respect to CBT, so we will introduce a second highly influential cognitive theory for depression, namely, "Hopelessness theory". First formulated by Abramson, Metalsky and Alloy (1989), hopelessness theory built on "helplessness theory" (Seligman, 1972), which found that dogs exposed to uncontrollable electric shocks would no longer attempt to escape, even when that become possible. Originally it was felt that this could describe the aetiology for depression, however it fails to explain why in the face of negative life events, some become helpless and not others. This led to the addition of an attributional component in the reformulated helplessness theory (hopelessness). Here, it is postulated that individuals make causal attributions along three dimensions; 'internal' or 'external', 'stable' or 'unstable' and 'global' or 'specific'. According to hopelessness theory, those who make internal, stable and global negative attributions are at greater risk of depressive symptoms. The concept of 'negative inferential style' was soon added to the attributional component of hopelessness theory. This stated that where negative early life experiences occur, children will look to find causal explanations. If they assign global and stable causes (as opposed to specific and unstable) this makes it more likely that the negative life experience will impact them in adulthood and manifest in depressive symptoms. As with CBT, we now have both content (negative inferential style) and process (causal attribution dimensions) in the hopelessness model. This separation was confirmed by Hankin, Lakdawalla, Carter, Abela and Adams (2007), who found support in an exploratory and confirmatory factor analysis for the separation between negative inferential styles and cognitive distortions. What remains unclear is the extent to which the separate components contribute to symptoms of depression.

Many studies have found a positive relationship between depression and the negative inferential style in non-selected samples (e.g. Barnum, Woody, & Gibb, 2013; Haeffel, 2011, Zhou, Chen, Liu, Lu, & Su, 2013 etc.) and in clinical populations (Abela, Stolow, Zhang, & McWhinnie, 2012; Rose, Abramson, Hodulik, Halberstadt, & Leff, 1994; Haeffel et al., 2005).

To establish causality, Mathews and Mackintosh (2000) introduced the 'interpretive bias training' method. The basic procedure involves exposing subjects to social stories, where the emotional valence remains ambiguous until the final sentence is revealed. The final sentence then disambiguates the story in either a positive or negative way. Often the final sentence is presented in some fragmented form, requiring subjects to actively engage in the narrative to disambiguate the valence. There is also occasionally a comprehension question which helps to reinforce the interpretation and ensure compliance. Since its introduction, variations of this basic method have proliferated, but all adhere to the basic principle of forcing subjects to resolve ambiguity either positively or negatively. Interpretive bias training has been applied to anxiety and depression with generally positive outcomes (i.e. Holmes, Lang and Shah, 2009; Yiend, et al., 2009; MacLeod & Mathews, 2012; Wilson, Macleod, Mathews and Rutherford, 2006). However, in a recent meta-analysis of 45 studies (N = 2,591), Hallion and Ruscio assessed the effect of negative cognitive bias modification (CBM; similar to negative interpretive bias training) on depression and anxiety. They found a strong effect of CBM on interpretation (g = 0.81). Yet, CBM had a small effect on anxiety and depression (g = 0.13). This effect was only reliable when a stressor preceded the assessment of symptoms (g = 0.23). Finally, assessing anxiety and depression separately, revealed that CBM only significantly modified anxiety, not

depression. The authors acknowledge that the small effect sizes exposed by the meta-analysis were inconsistent with their expectations. Their findings are partly supported by a second meta-analysis (Menne-Lothmann et al., 2014), which included 42 articles examining the effect of CBM on positive and negative interpretation bias, as well as emotional reactivity. They found an increase in positive interpretation bias and a decrease in negative mood state, but no effect on affect emotional reactivity. The authors conclude that under certain conditions, CBM could be a useful complementary treatment to usual psychotherapies. In the most recent and comprehensive meta-analysis of CBM on depression and anxiety. Cristea, Kok and Cuijpers (2015) included 92 CBM articles (97 randomised control trials). They took into account the quality of journals and risk of publication bias, as well as identifying outliers and examining both clinical and subclinical populations. They found that "For clinical samples, the effects of CBM interventions on anxiety and depression outcomes were small and, in most cases, non-significant; in the cases where they were significant, such as for depression, it seems to have been as a result of the presence of outliers and/or publication bias".

It therefore remains unclear whether CBM effectively produces better outcomes, with respect to depression and anxiety, by overcoming the negative interpretative bias. It could also be argued that a depressed patient, presented with positive alternatives to their usual negative interpretations, also becomes more flexible. As stated by Barber and DeRubies (1989) "cognitive therapy does not reduce the tendency for depressives to generate negative thoughts in distressing situations, but rather it inculcates a set of skills that helps them deal with these thoughts when they do occur". This means that training patients in positive interpretations or

reappraisals, increases their appraisal options (more flexibility) as well as makes them more positive. There is currently no study which determines the effects of increasing flexibility without altering valence; or to alter valence without increasing flexibility. It may be that the latter is impossible to empirically test.

1.5.2 Growing Focus on Dysfunctional Processes

Recently, within the science of well-being, there has been a growing shift in focus away from content and towards process. For example, Maor, Ben-Itzhak and Bluvstein (2014) write "the concept of psychological flexibility signals a move from simple, universal accounts or theories of positive versus negative emotions to a more contextual assessment of the functionality of a specific emotion or coping style". This sentiment is further endorsed by Kashdan and Rottentberg (2010), who argue for the benefits of psychological flexibility and are sceptical about prescribing positive thinking. For instance, they question the wisdom of the recommendation by Fredrickson and Losada (2005) that for every 1 negative thought, there should be 3 positive ones. They point out that people think negatively, and feel negative emotions, because they can be more useful than positive thoughts and emotions, especially with respect to making progress towards valued goals. Indeed, Gruber (2011) argues that positive emotion persistence (positive emotion that is independent of context) is a marker of bipolar disorder. This theory was based on earlier work (Gruber, Oveis, Keltner & Johnson, 2008) which tested 90 participants, in high and low mania risk groups. Through subjective, expressive, and physiological emotional responses, they found that participants at high risk for mania reported elevated positive emotions, more irritability and exhibited elevated cardiac vagal tone across

positive, negative, and neutral films. This demonstrates how inflexible positivity – just like inflexible negativity – can also be detrimental.

1.6 Absolutist thinking and Third Wave Therapies

There have been three waves of psychotherapy. The first wave was typified by Freudian psychoanalysis; it was past focussed, theory driven and placed a great importance on unconscious forces. The second wave, as we have already covered, was ushered in by the cognitive revolution of the late 1950's, and it included the cognitive therapies REBT and CBT. These are present oriented, empirically driven (particularly CBT) and place a great emphasis on explicit conscious thoughts and appraisals. With the exception of REBT, the second wave also therapies also target the 'contents' of patients thinking (i.e. the negative interpretive bias). Most recently, there has been a third wave of psychotherapies. These are increasingly focussed on addressing the processes of thoughts, rather than their content. They almost universally encourage greater metacognitive awareness, psychological flexibility and acceptance.

1.6.1 Mindfulness Based Cognitive Therapy

Mindfulness based cognitive therapy (MBCT) was a pioneering practice which in many ways begat the third wave psychotherapy movement. Originally developed in the early 1990's by Philip Barnard and John Teasdale, it was designed to decrease depressive relapse. MBCT borrows from the second wave cognitive therapies and combines them with eastern meditation and mindfulness practices. Despite deriving

inspiration from ancient and spiritual practices, practitioners are quick to differentiate the scientific MBCT psychotherapy from religious and pseudoscience alternatives.

The central component of MBCT is the elimination of categorical imperatives, or what Ellis had termed 'demandingness' in REBT. The underlying theory is that categorical imperatives (demands made for things to be a certain way) command our attention, which results in rumination, and induce strong emotional reactions (stress, anger, depression etc.; Lee & Orsillo, 2013). The goal of guided meditation is to increase 'awareness' of thoughts and feelings (meta-cognition) and then to accept them as they are. This was described by its early proponents Segal, Williams and Teasdale (2002, p.73) as "accepting and allowing what is". Meditators are encouraged to simply be aware of their thoughts without reacting to them or becoming attached. They are asked to cultivate an attitude of 'open curiosity' and 'compassion'. The drive to increase awareness is also said to disrupt maladaptive automatic thoughts.

Many literature reviews and meta-analyses have empirically demonstrated the clinical efficacy of MBCT. For example, Kuyken et al., (2016) conducted an individual patient data meta-analysis from randomized control trials for patients receiving MBCT. From 1258 patients included in the meta-analysis, they found a reduced risk of depression relapse within a 60-week follow-up period compared with those who did not receive MBCT (hazard ratio, 0.69; 95% CI, 0.58-0.82). There was also a reduced risk of depressive relapse within a 60-week follow-up period when compared with active treatments (hazard ratio, 0.79; 95% CI, 0.64-0.97). The authors also present some evidence that a greater severity of depressive symptoms prior to treatment produced larger effects of MBCT compared to other treatments.

In another meta-analysis, which focussed on the reduction in relapse rates after MBCT treatment. Piet and Hougaard (2011) found that in six randomised control trials (N = 60-145; total of 593), MBCT significantly reduced the risk of relapse by 34%. With a risk ratio of 0.66 for MBCT compared with either treatment as usual or placebo controls. Interestingly, with those that had suffered three or more depressive episodes, the risk reduction was 43%, however there was no risk reduction for those with less than three depressive episodes. MBCT was also found to be at least as effective as antidepressant medication in preventing depressive relapse. Importantly, the focus on relapse prevention, indicates that mindfulness is interacting with etiological factors of depression. Although, Chiesa and Serretti (2011) also point out that many studies included small sample sizes, non-randomized designs and the absence of comparisons between MBCT and control groups designed to specify underlying mediators. While most aim to eliminate categorical imperatives, MBCT has also been used to diminish dichotomous thinking (Alberts and Raes, 2012).

1.6.2 Acceptance and commitment therapy

Another prominent 'third wave' therapy is acceptance and commitment therapy (ACT). While in many ways related to mindfulness, it has a greater focus on acceptance and increasing 'psychological flexibility'. The theory behind ACT states that cognitive entanglement (akin to attachment in MBCT) creates rigidity, which leads to emotional disorders. Specifically, this cognitive entanglement is described as a "fusion with your thoughts". To increase psychological flexibility, ACT advocates observance and acceptance (like MBCT), this allows individuals to see themselves as distinct from their thoughts (termed "decentring").

As with MBCT, ACT discourages adherents from making judgements or evaluations of their thoughts; it is believed that this only increases cognitive entanglement and reduced flexibility. In a sense, both MBCT and ACT discourage appraisals, while REBT advocates disputing absolutist appraisals and instituting healthy non-absolutist alternatives. MBCT and ACT are so concerned about absolutist appraisals that they either discourage all appraisals, or permit only a select subset. For example, "loving-kindness" (or something similar) is promoted by third-wave therapies, where individuals adopt positive loving and kind appraisals. This seems too limiting, given that appraisals are an intrinsic part of our ability to regulate our behaviour and emotions. We require the ability to form adaptive negative appraisals, and third wave therapies appear to mostly ignore this important facet of emotion regulation.

Individual studies have shown that ACT has similar efficacy to CBT (Forman *et al.*, 2007; Zettle & Rains, 1989). Indeed, some studies even show greater efficacy for ACT (Branstetter *et al.*, 2004; Hernández López *et al.*, 2009; Lappalainen *et al.*, 2006; Zettle & Hayes, 1986). In a systematic meta-analysis, Powers, Vording and Emmelkamp (2009) combined the data from 18 randomized control trials (n = 917). These studies compared ACT with waiting lists, psychological placebos, treatment as usual, and established therapies. They found that ACT was superior to control conditions (effect size = 0.42) with ACT participants more improved than 66% of control conditions. ACT was also superior to treatment as usual (effect size = 0.42), but not significantly more effective than established treatments (effect size = 0.18, p = 0.13).

1.6.3 Dialectical Behaviour Therapy

Dialectical behaviour therapy (DBT) was developed for the treatment of borderline personality disorder, currently it is used for all mood disorders. It has many points of overlap with both MBCT and ACT. It also advocates awareness, acceptance and being non-judgemental about thoughts and feelings. While there are differences in practice, the meaningful difference in theory is the incorporation of dialectics. Here, clients are taught to reality test their thoughts by resolving a thesis and an antithesis through synthesis. Studies have also supported the efficacy of DBT (i.e. Kliem, Kroger & Kossfelder, 2010).

Fundamentally, all the various 'third wave' psychotherapy models promote increased psychological flexibility (Curtiss & Klemanski, 2014). They achieve this through the elimination of categorical imperatives by encouraging acceptance and promoting non-judgemental awareness of thoughts and feelings. As most third wave psychotherapies discourage evaluative thoughts, they in effect discourage appraisals. While eventually positive appraisals are promoted, the third-wave therapies provide little guidance on adaptive negative appraisals.

1.7 Absolutist thinking and Psychological Flexibility

1.7.1 Appraisal Flexibility Model

There has been growing interest in the study of psychological flexibility and mental well-being. Research in this area has been divided into multiple domains, these include emotion regulation flexibility, attentional flexibility, coping flexibility and explanatory flexibility. To the best of my knowledge, there is currently only one model

representing appraisal flexibility, that is the 'Appraisal Bias Model' as outlined by Mehu and Scherer (2015). Simply, this model sets out the importance of generating and utilizing different appraisals to suit different situations. An 'appraisal bias' refers to the tendency to appraise situations in the same habitual way, regardless of the context.

The authors identify two factors which hamper flexible and adaptive appraisal selection. The first is context related flexibility; this involves recognizing nuances in different situations and factoring them into appraisal generation. The second refers to appraisal 'extremeness', here the authors argue that extreme appraisals result in disproportionate emotional responses. The maladaptive character of inflexible and extreme appraisal, the authors argue, results in dysfunctional behavior and negative affect. They note that this model does not prescribe content (i.e. positive or negative thinking), rather its focus is on the 'modes of processing'.

1.7.2 Emotion Regulation Flexibility

Perhaps the largest field of psychological flexibility research concerns emotion regulation flexibility (ER-F). This refers to the ability of an individual to flexibly use multiple emotion regulation strategies. ER-F seems to be limited to between strategy flexibility and does not address within strategy flexibility (i.e. having strategies which are more or less flexible than each other).

There have been several review articles addressing the topic of ER-F (Kashdan & Rottenberg, 2010; Hollenstein et al. 2013, Bonanno & Burton 2014). The authors commonly argue that no one emotion regulation strategy is appropriate in all situations. This concept is termed the "fallacy of uniform efficacy" by Bonanno and

Burton (2014), who outline that adaptive emotion regulation flexibility involves (1) sensitivity to context, (2) the availability of a diverse repertoire of regulatory strategies and (3) responsiveness to feedback. Emotion regulation strategies include, but are not limited to, 'reappraisal', 'suppression', 'distraction' and 'disengagement'. There is also a separate class of coping strategies, these include 'problem focused coping', 'emotion-focused coping' and 'loss-oriented coping'. In a recent meta-analysis, Webb, Miles, and Sheeran (2012) found that there were only modest overall differences between emotion regulation strategies in their effectiveness for modifying emotional outcomes as indexed by experimental, behavioural and physiological measures.

It is argued that the efficacy of any one emotion regulation strategy is dependent on the situation. For example, Troy, Wilhelm, Shallcross, and Mauss (2010) found reappraisal was only effective in managing uncontrollable stressors, and paradoxically led to greater depression for people who experienced controllable stress. Similarly, Cheng and Cheung (2005) investigated coping flexibility among 27 undergraduate students. They found that those who cope more flexibly exhibited greater ability to differentiate (recognize multiple aspects in a 'perceived domain') and integrate (make connections between differentiated aspects of a 'perceived domain'). This was measured using the authors own Differentiation of Stress Situations (DSS) questionnaire, where participants are asked to rate the uncontrollable and unpredictable nature of different stressful situations. They argue that, more flexible participants could differentiate between controllable and uncontrollable situations. This resulted in flexible participants deploying greater monitoring strategies (attending to threat) in controllable situations and fewer monitoring strategies in uncontrollable situations. By contrast, those with lower coping flexibility deployed

more monitoring, irrespective of whether the situation was controllable or otherwise. Finally, countering the popular belief that some emotion regulation strategies are adaptive (i.e. reappraisal) and other are maladaptive (i.e. suppression), Aldao and Nolen-Hoeksema (2012) found that when different emotion regulation strategies were adopted across different situations, this was linked with lower psychopathology. This was not the case when they were adopted without context sensitivity.

1.7.3 Explanatory Flexibility

Where 'explanatory style' (measured using the attribution style questionnaire; ASQ) refers to the causes people assign to events in their lives, specifically how global and stable they believe those causes are, explanatory flexibility is concerned only with the amount of variability in explanatory style. Also measured using the ASQ, it does not report the mean (explanatory style) but rather, the intra-individual standard deviation for both global and stable items. In this way, explanatory flexibility is said to capture flexibility through variance and ignores content. Moore and Fresco (2007) set out to establish discriminant validity between explanatory style and explanatory flexibility through psychometric non-equivalence. As both constructs are measured using the same instrument (ASQ), there could potentially be some correlation between the cognitive content of responses (explanatory style) and the cognitive processes of responses (explanatory flexibility). The authors used two samples of undergraduate students to replicate their results. In the first sample, they found no correlation between explanatory style and flexibility (r (729) = .02, p = ns). In the second sample, they found a small to medium significant correlation (r (444) = − .18, p < .001). Overall

the data suggests that explanatory style and flexibility are distinct, albeit somewhat related constructs.

In a parallel study, Fresco, Rytwinski and Craighead (2007) found that explanatory flexibility interacted with negative life events, to predict depression symptoms. In a sample of undergraduates (N=78), experimenters administered the ASQ, the Beck Depression Inventory (BDI) and the Life Experiences Survey (LES), at two time points separated by 8-weeks. Findings revealed some overlap between low flexibility and a pessimistic explanatory style (r = −.27). Notably, time 2 depression was predicted by explanatory flexibility but not explanatory style, even after controlling for time 1 depression and explanatory style. The authors propose that explanatory flexibility moderates the relationship between negative life evens and depression. This was supported by the finding that for those high in explanatory flexibility, there was little association between negative life events and Time 2 depression scores. For those with low explanatory flexibility, on the other hand, there was a strong positive association between the number of negative life events and Time 2 depression scores. This may indicate that a lack of explanatory flexibility makes individuals fragile and overly vulnerable to life's stresses. Finally, the authors also highlight that there was a significant correlation between explanatory flexibility and extreme responding on the ASQ (r = .39). While the two variables are different constructs, they are related, in that extreme responders also tend to be more rigid. This finding was attenuated by the fact that most subjects did not choose extreme responses. Consequently, it was found that rigidity (explanatory flexibility), and not extremity, was predictive of time 2 depression.

A related construct to explanatory flexibility is 'coping flexibility'. A measure for this was developed by Williams (2002) and termed the "Coping Styles and Flexibility Inventory" (CSFI). This instrument calculates the mean and standard deviation of coping styles across 12 situations. Fresco, Williams and Nugent (2006) hypothesized that coping flexibility may mediate the protective effect of explanatory flexibility. They reasoned that those able to generate more explanations of situations, could also generate more solutions or ways to cope. A sample of undergraduate students (N=263), were administered the ASQ, CSFI, BDI and the Beck Anxiety Inventory (BAI). Structural equation modelling revealed that explanatory flexibility and coping flexibility were significantly correlated with one another, and they both add to the prediction of self-reported depression and anxiety symptoms. There was mixed support for the notion that coping flexibility mediates the effect of explanatory flexibility. The authors propose that these two variables represent 'two pathways' that directly connect to negative emotions.

Fresco, Heimberg, Abramowitz and Bertram (2006) were interested in the effect of negative mood priming on explanatory flexibility. This aimed to address the question of whether explanatory flexibility is the result of positive mood (lack of negative mood) or the cause of improved mood outcomes. The BDI, ASQ and several other questionnaires were administered to 97 participants. Subsequently, participants were asked to listen to sad music and think about upsetting times in their lives, they then completed the ASQ again. The diathesis-stress model argues that individuals vulnerable to depression have latent vulnerability factors that are only expressed in the presence of a negative stressor. We know that euthymic participants with a history of depression are vulnerable to depression. Therefore, when the results

showed that only euthymic participants with a history of depression evidenced a drop in explanatory flexibility. The authors concluded that explanatory flexibility is a vulnerability factor which is only expressed in the presence of a negative stressor consistent with the diathesis-stress model. There was no effect on never depressed and currently depressed participants because either they do not have the vulnerability, or because it is not latent.

The relevance of the cognitive diathesis-stress model to explanatory flexibility and its relationship with depression was examined by Lackner, Moore, Minerovic and Fresco (2015). The sample in this study was made up of 171 treatment-seeking patients, clinically diagnosed with Axis we psychopathology, in contrast to all previous studies which had used undergraduate samples. Baseline levels of explanatory flexibility and style were collected from patients with either major depressive disorder (MDD), generalized anxiety disorder (GAD), and other Axis we disorders. The results reveal that both MDD and GAD exhibited lower levels of explanatory flexibility relative to patients with other Axis we disorders. This supports the hypothesis that explanatory flexibility is a distinguishing factor between mood disorders and other Axis we disorders, as well as its role in the etiology of emotional disorders.

In summary, the construct of explanatory flexibility is consistent with a recent shift of focus away from the content and towards the process of thinking. It is proposed that the ability to generate multiple explanations for life events allows individuals to deal with stresses more adaptively. This is best demonstrated by evidence showing that those with high explanatory frequency were less likely to become depressed after negative life events in comparison to those with low explanatory flexibility. Explanatory flexibility was also linked to extreme responding

(both measured using ASQ), suggesting that both portray different aspects of an underlying cognitive rigidity. Finally, this construct was not related to all types of psychopathology (i.e., schizophrenia), but specifically and repeatedly linked to MDD and GAD.

1.7.4 Variance is Not Flexibility – A Widespread Mistake

There is a consistent mistake that permeates throughout all of the psychological flexibility literature - namely, the conceptualizing of flexibility as some version of variance, sometimes with the addition of a context sensitivity component. This can be observed in the explanatory flexibility literature reviewed above. Explanatory flexibility has been operationalized as the standard deviation of explanatory style responses. Yet this is not explanatory flexibility; it should more accurately be termed explanatory variance (or deviation). We argue that flexibility is more akin to *degrees of freedom* than to variance. That is, flexibility defines where variance can occur, but does not mandate it. Just as you can have infinite degrees of freedom and no variance, you can also have infinite flexibility without any corresponding change in behavior or cogitation. Flexibility merely refers to the factors that impact our *ability* to change, not change itself. We concede that more flexibility (like more degrees of freedom) allows for more sources of variance, but, it does not necessitate it. The difference here is profoundly consequential, as the literature currently views the utility of flexibility as curvilinear, entirely based upon this mistaken understanding of the concept. For example, Bonanno and Burton (2013) suggest there is an "upper limit" to the benefit of flexible responding. They argue that "too much sensitivity" to context leads to erratic thoughts and behavior. Indeed, their argument is sound, if

applied to variance, not flexibility. On the contrary, we argue that it is rigidity that leads to erratic thoughts and behaviors, not 'too much flexibility'. For example, an individual with an absolutist and rigid belief that they "*must please other people all the time*", will be forced to continually change their behavior/personality in order to achieve this. They must behave differently, with different groups of people, a quality colloquially referred as being "two-faced". They would therefore manifest high variability in their behavior, not due to flexibility, but due to a rigid belief that they must please others. Whereas, an individual that does not believe they "*must please other people all the time*", is free to maintain a more consistent personality.

Aldao, Sheppes and Gross (2015) do explicitly differentiate between variability and flexibility, however their conception of flexibility remains inadequate. In reference to emotion regulation flexibility, they outline that variability is the 'haphazard' changing of regulatory strategies, while flexibility is the covariation between variability and changes in the environment. The problem here is that 'covariation' is still variation. This simply demotes flexibility to a moderated form of variation, not as an entirely distinct concept. Consequently, the authors also assign a curvilinear utility function to flexibility, and outline 'maladaptive' forms of flexibility. The latter refers to any flexibility which interferes with goal attainment. What the authors fail to answer is why such flexibility, if it is "flexible", would prevail? Nevertheless, they conclude that while there are benefits to flexibility, we should also be sceptical about its utility.

While Aldao et al., (2015) conceptualise flexibility as a context-moderated version of variability, Hollenstein, Aschoff and Potworowski (2013) conceptualise flexibility as a time-moderated form of variability. They state that "because flexibility

is about change, it is necessarily a process that unfolds over time". This is perhaps the most illustrative example of this mistake so far; flexibility is not about "change", it is about *choice*. They go on to claim that "flexibility is a dynamic process. That is, it necessarily includes a temporal component as flexibility can only be observed as a change (or lack of change) over time." This leads to the structure of their proposed model of flexibility, which has three time frames, micro (moment to moment), meso (reactive) and macro (trait-like). Figure 1.1 is a simplified schematic of their 'basic conceptualisation of flexibility and rigidity'.

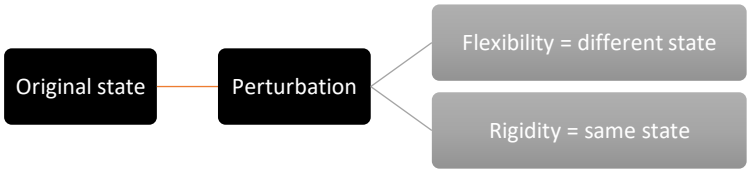

Figure 1.1 Simplified schematic of Hollenstein et al., 'basic conceptualisation of flexibility"

This view of flexibility has led the authors to frame the argument as a balance between either a "stick in the mud" or a "flip-flopping and spineless" person. They also recommend a curvilinear view for the utility of flexibility, outlining that the negative aspects of flexibility involve "lowered predictability of behaviour…and limited persistence toward achievement of personal goals". As before, confounding flexibility with variance.

Finally, there is one objection to high levels of flexibility which appears to be on firmer conceptual ground. Bonanno and Burton (2013) highlight the 'resource cost'

of greater flexibility. It can readily be seen that an absolutist belief or rigid response, which applies to all situations without any qualification, may be maladaptive, but is not resource intensive. Indeed the 'cognitive miser hypothesis', the preference for the simple and less effortful as opposed to the sophisticated and more effortful (Fiske and Taylor, 1984; Stanovich, 2009), is the most convincing explanation for the prevalence and indeed existence of absolutist thinking.

1.8 Absolutist Responding Predicts Depression

1.8.1 Teasdale et al., (2001)

In an influential paper, Teasdale et al., (2001) noted that while cognitive therapy (e.g., Beck, Epstein, & Harrison, 1983) has been shown to reduce the risk of depressive relapse (Fava, Grandi, Zielezny, Rafanelli, & Canestrari, 1996; Shea et al., 1992), the precise mediator for this effect has not been established. They examined 5 measures which are purported to mediate reductions in depressive relapse; (1) the Attribution Style Questionnaire (ASQ; Peterson et al., 1982), (2) the Dysfunctional attitude scale (DAS-Need for social approval subscale; e.g., Beck, Epstein, & Harrison, 1983), (3) the Perceived Uncontrollability of Depression Questionnaire (UNCONTROL; e.g. Teasdale, 1985), (4) the Characterological Self-Blame for Depression Questionnaire (BLAME; Teasdale, 1985) and finally (5) the Metacognitive Awareness Questionnaire (MAQ; e.g. Teasdale, 1985).

The study recruited 158 currently remitted outpatients, with recent major depression within the last 18 months but not in the last 2 months. Patients were partially remitted with residual symptoms, scoring at least 8 on the 17-item Hamilton Rating Scale for Depression (HRSD; Hamilton, 1960) and 9 on the Beck Depression

Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). All 158 patients were managed on antidepressant medication (ADM), with a subgroup (N = 80) receiving 20 weeks of cognitive therapy treatment (16 sessions). These were delivered by trained practitioners in line with Beck et al. (1979). The CBT treatment subgroup later received 2 cognitive therapy booster session in the 48 weeks follow up, and all patients continued to be managed on ADM. Patients' clinical states were assessed before the treatment, monthly during treatment, and bimonthly in the follow up phase. Assessments of cognitive variables were made before treatment, at 8 weeks, and at the end of the 20-week treatment period. Depressive relapse was determined using the DSM-III-R criteria, successive face to face interviews, and a score of 17 on the HRSD.

The authors found that cognitive therapy reduced the risk of relapse by approximately 40%. Moreover, they also found no difference in post-treatment depression scores between the cognitive therapy group and controls (clinically depressed, non-CBT intervention group). This meant that cognitive therapy predominantly improved outcomes by reducing the risk of future relapse, not by reducing current depressive symptoms. They found that the cognitive therapy effect on relapse was only observable at 8-weeks not 20 weeks, therefore 8-weeks served as the post-treatment time point, because there was no post-treatment effect to explain for 20-weeks. Baseline BDI scores alone were predictive of relapse; of the other five cognitive variables tested, none predicted depressive relapse after controlling for initial levels of depression, at either week 0 or week 8. Most surprisingly, exploratory analyses revealed that ASQ scores at week 0, which were more reflective of a high depressotypic attributional style, predicted less risk of relapse, rather than more. The

authors decided to investigate this surprising result by inspecting the data more closely, finding that relapse was associated with use of extreme scores (1 or 7 on 7-point scale). This association held for both extreme attributional responses typical of depression and extreme attributional responses untypical of depression.

For each item in the ASQ, patients can make as many as 3 extreme responses, out of a total of 6. These relate to whether the situation is down to “me” or “other people”, whether it will “always be” or “never” recur and whether it impacts “all” situations or just this particular one. These are either attributions endorsed with a score of 1 (“totally due to other people or circumstances”, “will never again be present” and “influences just this particular situation”) or attributions endorsed with a score of 7 ("totally due to me," "will always be present," and "influences all situations in my life"). These attributions are made for both positive and negative events. While some responses are depressotypic (i.e. global and stable attributions for negative explanations) others are undepressotypic (specific and unstable attributions for negative explanations) for example, an unsuccessful job application is viewed as just this particular situation and won’t happen again. Surprisingly, the authors found that extreme undepressotypic responding predicted early relapse more than extreme depressotypic responding. The most significant predictor was the response indicating that causes of bad outcomes "will never again be present”. Strong evidence was found for a general tendency within individuals to respond extremely, by significant intercorrelations between extreme 1 and 7 scores for good and bad attributions.

This exploratory analysis of the ASQ data generated a new hypothesis, namely, that extreme responding would predict greater relapse rates. The authors tested this hypothesis on the remaining 4 cognitive variables (DAS, UNCONTROL, BLAME and

MAQ). When the sum of extreme responses was calculated, they were found to significantly predict time to relapse at both week 0 and week 8. This remained significant even when initial depression was controlled; indeed "relapse in patients showing any extreme score was more than 2.5 times the rate in patients with no extreme scores". The authors report that on week 0 measures, patients with no extreme scores showed 17% relapse, whereas those with any extreme score showed 44%; and on week 8 measures, patients with no extreme scores showed 15% relapse, whereas those with any extreme score showed 42%. Therefore, the only predictor of relapse rates, among the five cognitive variables tested, was extreme responding for both functional and dysfunctional responses.

The authors argue that these extreme scores (1 + 7) reflect an underlying "absolute", "dichotomous" and "black and white" cognitive style. To test this, they calculated the sum of 'next to extreme scores' (i.e. "agree very much" or "disagree very much"). Sum of next to extremes did not predict relapse from either Week 0 or Week 8. This is crucial to the distinction between the terms 'absolute' and 'extreme', as discussed in the introduction (figure 1.1). Although the terms absolute and extreme are used interchangeably in this paper, this analysis suggests that a distinction should be made, primarily because next to absolute responses may still be 'extreme', but they are not absolute. This finding is consistent with Litinsky and Haslam (1998), who found that weaker forms of dichotomous thinking (i.e. non-binary) were not associated with suicidal ideation.

In conclusion, the authors recognise that all five cognitive variables, tested to predict depressive relapse failed, and did not show mediational qualities. However, they argue that while the content of the items was not predictive, the form of the

responses (absolute) displayed "significant and substantial prediction of relapse, differential response to CT, and conformity to mediational criteria". It may therefore be that CBT mediates relapse prevention by causing a "shift in cognitive mode", from absolutist and dichotomous, to a more nuanced, sophisticated and qualified mode.

1.8.2 Beevers, Miller, Keitner and Ryan, (2003)

In a partial replication attempt of the Teasdale, et al., (2001) study, Beavers, Miller, Keitner and Ryan (2003) used extreme responding scores from 120 hospitalized depressed patients to predict time to relapse. In hospital, patients received family therapy (Epstein & Bishop, 1981), Cognitive-Behavioural Therapy (Beck et al., 1979) or a combination. They also completed the Modified Hamilton Rating Scale for Depression (MHRSD) and the Dysfunctional Attitudes Scale (DAS). Extreme response scores were calculated in the same way as Teasdale et al., (2001), by summing up the number of extreme responses on the DAS (i.e. totally agree or totally disagree). On discharge, treatment continued for 6 months, outpatients were then reassessed with the MHRSD and the DAS. Subsequently they were monitored for 1 year (1 year follow up period), in which time they were contacted monthly and completed interviewer assessments. For cognitive factors to be causal (i.e. cognitive vulnerabilities), their scores should be associated with subsequent depressive relapse. The authors selected a subsample (N = 53) of participants who reported significant depression improvement and were at least partially asymptomatic following acute in-hospital depression treatment. These patients reported 50% reduction in MHRSD score, a commonly used criterion to define symptomatic improvement. Among this subsample, the authors then examined whether a change in DAS and extreme

responding scores, between pre-treatment to posttreatment, could predict time to recurrence of clinically significant depressive symptoms, during the year long follow-up period. Analysis was conducted on the basis of residual change scores, that is, the difference between the patient's change score and the average change score. This was in order to account for regression to the mean. Change in depression was factored into the regression model. Return of clinical depression was defined as a score of 17 on the MHRSD (the same as Teasdale et al., 2001).

The study found that acute hospital treatment reduced depressive symptoms and dysfunctional attitudes as measured by the DAS, but there was no effect of treatment on extreme response style. The authors note that the correlation between extreme responding tendency on admission to hospital and at discharge after treatment was large (r = .56), suggesting that extreme responding is a relatively stable trait. In a Cox regression survival analysis predicting time to symptom return during the follow-up period, several participant characteristic variables were found to be significantly associated with time to recurrence. These variables (e.g. number of previous depressive episodes, patient age) were used as covariates along with pre-treatment to posttreatment change in depression. After controlling for covariates, including change in depression scores, a cox regression found that change in DAS and extreme responding both significantly improved the predictive ability of the model. Every "one unit" increase in change for DAS and extreme responses was associated with a 2% and 6% decrease in rate of symptom recurrence, respectively. Participants reported more extreme positive than extreme negative responses (i.e. totally agree with functional items and totally disagree with dysfunctional items). Absolute levels of DAS and extreme responding (not change), did not significantly improve the model.

These finding generally support those of Teasdale et al., (2001), however they indicate that it is change in these cognitive variables which mediates reduced rates of relapse, rather than absolute values.

1.8.3 Peterson et al., (2007)

Peterson et al., (2007), also conducted a replication study of Teasdale et al., (2001). The study had access to 384 depressed outpatients who were undergoing an 8-week acute phase treatment on antidepressant medication (fluoxetine). Remitted patients were then entered into a second 19-week continuation phase, in which their fluoxetine dose increased, and they were randomly assigned to treatment with or without cognitive–behavioural therapy (CBT). All patients completed the ASQ and DAS during the acute phase, the start of the continuation phase and the end of the continuation phase. Extreme responding was calculated in the same way as Teasdale et al., (2001). Analysis was conducted through logistic regression to evaluate the relationship between extreme response style and relapse. Return of depressive symptoms was defined as a score of 15 on the HRSD on two consecutive occasions.

There were no significant differences in rates of depression relapse between antidepressant only and CBT + antidepressant patient groups at the end of the continuation phase. The authors argue that this may be due to higher doses of antidepressants prescribed at the start of the continuation phase. However, the study did find that extreme responding on the stable/unstable attributional dimension predicted decreased likelihood of "full depression remission" after the 8-week acute treatment phase. This effect was controlled for gender and baseline differences in severity of depression. This effect was only significant for the stability dimension and

not for the globality or internality dimensions (as described previously). This is partially consistent with Teasdale et al., (2001) where the stability dimension was revealed to be the most predictive of relapse (i.e. *bad things will never happen again*). Extreme responding on the DAS was also predictive of better acute treatment phase outcome, supporting the findings of both Teasdale et al., (2001) and Beevers et al., (2003). Additionally, extreme responding on both the ASQ and the DAS predicted non-responders to the acute treatment phase. The authors argue that those with less extreme response styles possessed higher levels of "metacognition" which led to their eventual remission. Interestingly, in the continuation phase, those on antidepressant treatment only, showed a significant increase in extreme responding on the ASQ and DAS, while those receiving CBT did not. The authors advise that future studies should "refine the methodology for measuring extreme responses". Every study to date has used extreme responding on a Likert type scale to investigate the form versus content of cognitions. This requires an assumption that such responding truly reflects rigid and dichotomous thinking styles, though there is currently no empirical support for such an assumption.

1.8.4 Ching and Dobson (2009)

In another replication of Teasdale et al., (2001), Ching and Dobson (2009) examined the role of extreme responding as a mediator of relapse prevention, as well as predictor of acute treatment outcomes. The study recruited 107 clinically depressed participants, before being assigned into separate treatment groups, all participants were asked to complete the Expanded Attributional Style Questionnaire (EASQ; Pertson & Vinnanova, 1988). While this measure is similar to the ASQ, there are

however no positive items, and despite having 24 negative items, the authors only used six. Extreme responding was calculated in the same way as Teasdale et al., (2001). Participants were then randomly assigned to two treatment conditions; a cognitive therapy group (CT; N = 50) and a behavioural activation group (BA; N = 57). This treatment constituted the acute therapy phase of the study; depression status and severity were measured using the BDI and HRSD. On completion of acute phase treatment, participants again completed the EASQ and were subsequently monitored for a period of 12 months. Relapse was assessed using a retrospective assessment of depressive symptoms. Based on the occurrence of relapse, the total number of 'well-weeks' was calculated as the number of weeks during follow-up that the participant had minimal symptoms.

Analysis of the results from the 12-month follow-up period revealed that both groups had similar relapse rates and average number of well-weeks (CT = 52% relapse and 36.6 average well-weeks; BA = 61% relapse and 36.49 average well weeks). While participant's initial level of depression significantly predicted relapse, the composite extreme response score on the EASQ did not improve the regression model above that of initial depression levels alone. The results from the acute treatment phase found no significant difference in depression reduction between the two groups. Depression had abated in 72% of patients in the CT group and 61% of patients in the BA group. There was also no significant reduction to extreme responding scores after CT, and ER did not predict or moderate acute treatment outcomes. The authors do acknowledge that limited variability in the data may have constrained the ability to find an effect.

With a view to future research, the authors recommend subsequent studies

examine the construct validity of extreme response measures. Namely, the extent to which these responses truly reflect dichotomous or extreme cognitive processing. They also encourage the comparison of alternative definitions for extreme responding which could also be measured using different methods.

1.8.5 Jacobs et al., (2010)

Jacobs et al., (2010) examined extreme responding in 327 adolescents with depression, many of who were suffering depression for the first time. Participants were allocated to one of three treatment groups; a CBT group, an ADM group and a combination group. Participants completed the DAS before and after the treatment phase, ER was calculated in the same way as Teasdale et al., (2001). Authors found that in both the acute and continuation phase, initial ER scores did not predict failure to maintain remission. A treatment-by-time interaction significantly predicted levels of extreme thinking across 36 weeks, this was driven by greater positive ER in the CBT group. This indicated that the content of the items (positive or negative) interacts with the form of the response (absolute or moderate). There were some differences between this study and that of Teasdale et al., (2001), which may explain the discrepant findings. Firstly, Teasdale et al., (2001) enlisted chronically depressed patients, whereas in this study, many of the participants were enduring depression for the first time. First onset depression patients may not have established extreme responding tendencies which develop in the chronically depressed. Secondly, multiple sources have found that extreme responding is more normative in the young (e.g. Pertejo & Martinez, 2014; Romero, 2012), including the original Teasdale et al., (2001)

paper. Finally, this study was also underpowered as relatively few participants failed to maintain remission.

1.8.6 De Graaf, Huibers, Cuijpers and Arntz, (2010)

De Graaf, Huibers, Cuijpers and Arntz (2010) used a large community sample (N = 1129), recruited on behalf of an internet-based cognitive behavioural therapy program. Depressed participants were asked to complete depression measures, and were divided into three severity groups based on the number of DSM IV symptoms: Mild depression with 2-4 symptoms, major depression with 5-6 symptoms and major depression with 7-9 symptoms. Participants also completed the DAS, and ER scores were calculated in the same way as Teasdale et al., (2001). Unlike past research, this study recognised the confounding effect of depression and 'content contamination' of the extreme response style measure. For this reason, the authors also administered the 'Questionnaire without Questions' (QWQ; Berg, Rapaport, 1954). This is a contentless measure, participants have to answer based purely on the presentation of the responses. Previous studies using the QwQ have shown that healthy individuals seem to avoid extreme responses and tend to have a preference for positive answers (de Jonge and Slaets, 2005).

Results revealed that extreme responding on the DAS and the QwQ substantially distinguished major depression from minor depression. This builds on the findings from previous studies, showing that extreme responding is not only predictive of relapse or poor treatment outcomes, but also strongly associated with an increasing number of depressive symptoms. The authors suggest that the importance of the specific content of cognitions in major depression might need to be

reconsidered. They argue that "next to seeking to modify the content of cognitions, which is classically the main feature of cognitive therapy, clinicians and researchers should also seek ways to reduce the extreme response style of depressed patients". The authors did find however, that positive extreme responding was greater in mild depression and negative extreme responding was greater in major depression. This was also the case for the QwQ, which had senseless items. Finally, the authors recommend that a new methodological method should be developed to measure absolute response style. The QwQ (questionnaire without questions) is an improvement on the DAS and ASQ, with respect to measuring response style in depression, as it purports to measure response style without interference of item content. Nevertheless, the authors advocate that "future research should refine the methodology for measuring extreme responses".

1.8.7 Forand and DeRubeis, (2015)

In all the studies in this research area reviewed above – except for the QwQ – there is a confound between the content of the items on the measures used and the style of response. This confound was detected by Forand and DeRubeis (2015), who seek to identify "stylistic, mal-adaptive, extreme positive responding" which confounds the DAS measure and ER on the DAS measure. To clarify, the authors believe that the DAS contains two types of positive responses, those which are functional (content responses), and those which "appear dysfunctional" (style responses). They cite the following example, on the item "If we ask a question, it makes me look inferior", they argue that the extreme positive response (totally disagree) is functional. However, the same response to "It is awful to be disapproved of by people important to you",

appears dysfunctional, as the authors argue it may suggest "ignorance or disregard" therefore a non-absolute response may be more rational. The DAS has a number of such items, this study enlisted clinical psychologists and asked them to complete the DAS, in the way they would like to see one of their clients complete it. There responses were highly correlated (.81), they identified some functional extreme positive responses (17 content responses) and dysfunctional extreme positive responses (23 style responses). The authors hypothesis, that those with extreme response style tendencies, will make extreme responses for both content and style items. While, those who predominantly make extreme responses on content items, are responding on the basis of content not style.

In a randomised control study design, a sample of clinically depressed participants (N = 180) were randomized to a cognitive therapy group (N = 60) or an antidepressant medication only group (N = 120), for an acute phase treatment period of 16 weeks. Treatment responders (N = 35 and 69, respectively) were followed up for 12 months. All participants completed the DAS before and after treatment, ER scores were then used to predict relapse rates.

Results showed that even in this clinically depressed cohort of participants, positive extreme responses were more prevalent than negative extreme responses (73% of all ER), and post-treatment this rose even further (96%). While no extreme response variable alone predicted relapse, the style versus content index did significantly predict relapse and recurrence. Namely, those that endorsed more extreme style responses relative to content response, had a greater risk of relapse.

1.9 Conclusion and Objectives

This thesis is focussed on absolutist thinking and its relationship with wellbeing. We define absolutist thoughts as those which denote a state of uncompromising totality, independent of context and unqualified by nuance. Absolutism primarily manifests as categorical imperatives or dichotomous expressions. In the preceding literature review, we have shown that a clear definition of absolutism, distinct from form extremism, has not been conceptually or empirically established. The term extreme is preferred in the literature and used interchangeably with absolute. This betrays a failure to recognise the difference between holding fringe views which lie on a continuum (extreme), and total categorical beliefs which are a gross simplification of the world but are not necessarily extreme (absolute). We argue that a distinction between extreme and absolute appraisals has impacts on the rationality, flexibility and emotional consequences of those appraisals.

We have reviewed how absolutism has previously been measures, through structured response formats, extreme responding on Likert scales and some analysis of natural language samples. The latter, is usually achieved by recruiting independent human rater's to code the text, but there are also instances where automated text analysis has been employed (Fekete, 2002). We aim to extend this work by validating an absolutist words dictionary which we will then employ in conducting automated text analysis on natural language. As well as having greater ecological validity, this method will also be more flexible than previous methods as it can be applied to both experimental and observational data. Naturally, we will assess its construct validity by comparing it to extreme responding on Likert scales. Using our more ecologically valid method for estimating absolutist thinking, we aim to establish links between an

absolutist thinking style and wellbeing. Specifically, affective disorders (anxiety, depression and suicidal ideation) which we expect to correlate positively with absolutist thinking styles. This is based on the clinical practice literature, especially the REBT and the cognitive distortions in CBT, as well as the previous experimental studies reviewed above. We intend to compare the relative association between an absolutist thinking style and wellbeing, with that of a negativistic thinking style and wellbeing. The association between negativity and well-being has long been established, indeed for many, the two concepts are almost synonymous. We intend to empirically demonstrate, that although less intuitive, absolutist thinking has an equally strong association with wellbeing to that of negativity. This taps into an emerging debate in the field of mental health. Namely, is affective disorder the result of content (negative thinking) or process (cognitive rigidity). For this reason, in many parts of the thesis, we will not discuss absolutist thinking in isolation, but compare it to negative thinking. Finally, we will begin to demonstrate an association between absolutist thinking and cognitive rigidity. These two concepts are often assumed to be linked, however there is little empirical evidence demonstrating the association. The link may be important in explaining the mechanism by which absolutist thinking could give rise to affective disorder.

Chapter 2: In an Absolute State: Elevated use of Absolutist Words is a Marker Specific to Anxiety, Depression and Suicidal Ideation

2.1 Chapter overview

Absolutist thinking is considered a cognitive distortion by most cognitive therapies for anxiety and depression. This is predicated on clinical observations and the efficacy of CBT in general (not the practice of examining absolutist thoughts specifically). As reviewed in the previous chapter, the few studies that do pertain to absolutist thinking, have used Likert type scales, which lack ecological validity.

Our aim was to examine the prevalence and specificity of absolutism in the natural language of those with various affective disorders such as anxiety, depression and suicidal ideation. By analysing ordinary language, we hoped to estimate absolutism in a more informative and ecologically valid manner.

Across three studies, we conducted a text analysis of 63 internet forums (over 6,400 members), using an in-house python text analysis program and the Linguistic-Inquiry and Word Count software (LIWC; Pennebaker, Booth, Boyd, & Francis, 2015). We first constructed and independently validated an absolutist words dictionary. The dictionary contained 19-words which were deemed absolutist by clinical and linguistic experts at the University of Reading. Our in-house python program and the LIWC determine the percentage prevalence of these absolutist words, by calculating their frequency in a given text and the total word count (absolutist words/total word count).

For study 1, we predicted and found that anxiety, depression and suicidal ideation forums contained more absolutist words than control forums (*d*'s > 3.14); and that suicidal ideation forums also contained more absolutist words than anxiety and depression forums (*d*'s > 1.71). Previously, it had been found that pronouns and negative emotion words were the strongest markers for affective disorder in natural language (e.g. Rude, Gortner, & Pennebaker, 2004). Interestingly, we found that absolutist words produced larger effects than pronouns and tracked the severity of affective disorder natural language more faithfully than negative emotions. Paradoxically, negative emotion words were more prevalent in anxiety and depression forums than suicidal ideation forums. Assuming that suicidal ideation is the more severe manifestation, we would expect a marker of affective disorder to correspondingly track this severity. Overall, absolutist words proved to be better markers for anxiety, depression and suicidal ideation natural language than any of the dictionaries contained in the LIWC package (e.g. affect word, sadness words etc.)

For study 2, our aim was to determine whether greater use of absolutist words reflected psychological distress or absolutist thinking specifically. We examined internet forums for borderline personality disorder (BPD), eating disorders (ED), post-traumatic stress disorder (PTSD) and schizophrenia. We believed that these groups would have similar levels of psychological distress, but different levels of absolutist thinking. Based on the literature (reviewed in this chapter and the previous chapter), BPD and ED have repeatedly been associated with absolutist thinking, while PTSD and schizophrenia are relatively less associated with absolutist thinking. Importantly, there were similar levels of negative emotion words between the groups. This

suggests that elevated use of absolutist words reflects absolutist thinking and not psychological distress per se.

In a subset of depression and suicidal ideation forums, there were occasionally 'recovery forums'. These allow members who believe they are feeling better (recovered or remitted) to write about their improvement. In study 3, we calculated the percentage prevalence of absolutist words in these forums. We found that recovery forums contained significantly more absolutist words than control forums and were not significantly different from anxiety and depression forums. This suggests that absolutist thinking may be a cognitive vulnerability of depression.

2.2 Introduction

'Absolutist thinking' underlies many of the cognitive distortions (Beck, 1979; Burns, 1989) and irrational beliefs (Ellis & Harper, 1975) which are purported to mediate the core affective disorders. Words, phrases and ideas that denote totality, either of magnitude or probability, are often referred to as 'absolute'. Absolutist thoughts are independent of context and unqualified by nuance. In three observational studies, we aimed to measure absolutist thinking in a specific and ecologically valid manner. We then compared its relative association between a variety of affective and non-affective groups.

Absolutist thinking has strong empirical links to three distinct mental health groups: *suicidal ideation, borderline personality disorder (BPD) and eating disorders (ED)*. Regarding suicidal ideation, structured response formats have shown more extreme value judgments by suicidal patients than controls (e.g. Neuringer, 1961; 1964). Thematic analysis by independent rater's also deemed the stories and poetry

of suicidal individuals as highly 'polarized' (Litinsky & Haslam, 1998; Wedding, 2000). Additionally, dichotomous thinking, cognitive rigidity and problem-solving deficits have been repeatedly found to co-occur in suicidal individuals (for review see Ellis and Rutherford, 2008). This is supported by a series of empirical studies from Pollock and Williams (1998, 2001, 2004).

BPD patients also make more extreme responses on structured response formats than controls (e.g. Veen & Arntz, 2000; Napolitano & Mckay, 2007; Sieswerda, Barnow, Verheul & Arntz, 2013; Moritz et al. 2011). Some studies have used 'spontaneous reactions' or short interviews to identify extreme or dichotomous thinking styles (e.g. Arntz & Veen, 2001; Arntz & Haaf, 2012).

With respect to ED, the 'Dichotomous thinking in eating disorder scale' (DTEDS; Byrne et al., 2008) is widely used in ED studies (e.g. Antoniou, Bongers & Jansen, 2017; Palascha, van Kleef & van Trijp, 2015). Although obesity and anorexia are often studied separately, they both link to absolutist thinking. For obesity, several reviews have found that avoiding absolutist dichotomous thinking improves weight loss maintenance (e.g. Ohsiek & Williams, 2011). Absolutism often takes the form of perfectionism in anorexia, as identified through clinical observations (e.g. Garner, Garfinkel & Bemis, 1982; Fairburn, Cooper and Shafran, 2003) structured response formats (e.g. Feixas et al., 2010; Zotter & Crowther, 1991) and interviews (e.g. Johnson and Holloway, 1988)

Despite the inclusion of absolutist thinking into many cognitive therapy models for anxiety and depression (Beck, 1979; Burns, 1989; Williams & Garland 2002); this association remains mostly neglected in the empirical literature (Ellis, 1987). In a notable exception, Teasdale et al., (2001) found that an 'absolutist, dichotomous

thinking style' predicted future depressive relapse, over and above the content of responses. This was evidenced by both positive and negative 'extreme responses' on Likert type scales.

Attempts to investigate absolutist thinking have mostly employed some type of structured response format. Ertel (1985) was the first to use quantitative text analysis to measure dogmatism with the manual 'Dogmatism text analysis tool' (DOTA). More recently, with the advent of automated text analysis, Cohen (2012) measured 'cognitive rigidity' in the 'spontaneous autobiographical narratives' of undergraduate students, and found correlations with negative emotionality. Unlike structured response formats, these natural language text analysis studies have more ecological validity.

With the growth of social media, internet forums are increasingly being used as a source of naturalistic writing for research in depression and other affective disorders (e.g. Fekete, 2002; Griffiths, Calear & Banfield, 2009; Houston, Cooper & Ford, 2014). It is believed that insights into the cognitive processes associated with particular affective disorders can be gleaned from how people with those disorders write about their experiences. In three connected studies, we investigated the frequency of absolutist words contained in different affective and non-affective internet forum groups (Table 2.1; see Appendix 3 for more details). In the first study we compared anxiety, depression and suicidal ideation (*test*) groups with 'general', asthma, diabetes and cancer (*control*) groups. We had two specific hypotheses:

Hypothesis 1 (H_1)*:* The percentage of absolutist words in anxiety, depression and suicidal ideation test forum groups will be significantly greater than study 1 control forum groups.

Hypothesis 2 (H_2)*:* The percentage of absolutist words in the suicidal ideation forum group will be significantly greater than in both anxiety and depression forum groups.

Our second hypothesis is partly based on the strong association between suicidal ideation and absolutist thinking (for review see Arffa, 1983). But also, as suicidal ideation is the more severe mental health concern, it could be hypothesized that absolutist thinking will be correspondingly more extreme.

In study 2, our aim was to show that absolutist words reflect absolutist thinking, rather than psychological distress. We attempted to control for psychological distress by comparing groups believed to have similar levels of negative emotions but different levels of absolutist thinking (Table 2.1 and see Appendix 3 for more information). We compared mental health groups strongly associated with absolutist thinking (*borderline personality disorder* [BPD] and *eating disorders* [ED]; cited above) with mental health groups less associated with absolutist thinking (*post-traumatic stress disorder* [PTSD] and *schizophrenia*). While we recognize that PTSD and schizophrenia may also have some links to absolutist thinking, the literature suggests these links are likely to be much weaker than those of BPD and ED. There are relatively few studies that have examined absolutist thinking in PTSD and schizophrenia, and these have often been limited or produced mixed results (e.g. Colbert, Peters & Garety, 2010; Joseph & Gray, 2011). Conversely, there is a

widespread consensus, based on a multitude of studies, that BPD and ED are firmly linked to absolutist thinking (e.g. Napolitano & Mckay, 2007; Veen & Arntz, 2000; Alberts, Thewissen & Raes, 2012). We also measured the frequency of negative emotion terms to further support the assumption that the four mental health groups had comparable levels of negative emotions.

Hypothesis 3 (H_3)*:* The percentage of absolutist words in BPD and ED test forum groups will be significantly greater than in PTSD and schizophrenia control forum groups.

In study 3, we aimed to determine the extent to which absolutist thinking could be a cognitive vulnerability factor for depression and suicidal ideation. In a subset of depression and suicidal ideation forums, there are 'recovery' sub-forums (Table 2.1 and see Appendix 3 for more information). These sub-forums are visited by members who feel they are currently out of depression. They often write very positive posts about their progress and words of encouragement to other members. Theoretically, a cognitive vulnerability factor should not only be present during an episode of depression but also persist during recovery, therefore:

Hypothesis 4 (H_4)*:* The percentage of absolutist words in the recovery forum group will be significantly greater than study 1 control forum groups.

Previous text analysis research has examined many different dictionary 'dimensions'. When analysing written samples from anxious, depressed or suicidal individuals, an

increased use of 'personal pronouns' and 'negative emotion words' has commonly been found (Bucci & Freedman, 1981; Fekete, 2002; Lorenz & Cobb, 1952; Rude, Gortner, & Pennebaker, 2004; Stirman and Pennebaker, 2001; Weintraub, 1981). In particular, pronouns have been identified as having a stronger relationship with affective disorder than negative emotions (Pennebaker & Chung, 2013). Like pronouns, absolutist words are functional; they help determine our style of writing, not its contents. Moreover, functional words are ordinarily outside of conscious control (Pennebaker & Chung, 2013), therefore they can serve as implicit markers. We believe a shift in focus to 'how' we think, rather than 'what' we think, can provide greater insight into possible cognitive mechanisms underlying affective disorders.

From the outset, we identified and validated a single dictionary of interest, as this study was motivated by specific apriori hypotheses. This is in contrast to previous text analysis studies that have used a subset of already constructed dictionaries, or identified features of interest based on the data itself (e.g. using an iterative process with cross-validation and feature reduction; Mladenic, 2005). The large dataset in this study, from 12 different groups, representing 63 different internet forums, and over 6,400 members afforded a degree of ecological validity not achievable in experimental studies. However, as with many observational studies, these benefits come with inherent costs. We had limited information about the members posting in the forums, and for the most part, their true identities and motivations were unknowable. Recognising this limitation, we hope that follow-up studies, using alternative experimental designs, will extend the findings presented here.

2.3 Method

2.3.1 Forum Selection

We used English language internet forums as a source of naturalistic writing for our test and control categories. For all three studies, representative websites were located through a Google search (search words: i.e. "suicide forums", "asthma forums"). Forums were selected for inclusion into the study based on Google rank (Table 2.1 and see Appendix 3 for more details), were popular (thus yielding sufficient data for analysis) and actively moderated with clearly written moderation policies. Each group in the test and control categories was comprised of between four to seven separate forums, as determined by forum availability. For study 1, control groups were carefully selected to provide the broadest level of control. The 'general' group provides a gender control with two forums for female members (Mumsnet and Ladies Lounge) and two for male members (Askmen and Gentlemen's Club). The general group also controls for age, with a designated forum for young members (Student Room) and older members (Pensioners Forum). The asthma and diabetes groups control for chronic physical illness, and the cancer group controls for severe physical and psychological distress. Study 3 'recovery' forums were located within study 1 depression and suicidal ideation test forums.

Table 2.1 Characteristics of Test and Control Internet Forums.

		Group	Forums[b]	Members[c]
Study 1	Control	General[a]	7	917
		Asthma	4	418
		Diabetes	4	587
		Cancer	4	451
	Test	Anxiety	6	597
		Depression	6	529
		Suicidal Ideation	4	368
Study 2	Control	PTSD	6	534
		Schizophrenia	6	591
	Test	BPD	4	326
		ED	5	547
Study 3		Recovery	7	558

Note. PTSD = Post Traumatic Stress Disorder; BPD = Borderline Personality Disorder; ED = Eating Disorder. [a] General Forums = 'Mumsnet' (Women), 'The Ladies Lounge' (Women), 'The Gentlemen's Club' (Men), 'Ask Men' (Men), 'Pensioners Forum' (Elderly), 'Student Room' (Young), 'Work Problems'. [b] Number of internet forums in each group. [c] Number of members which contributed to that group's corpus.

2.3.2 Data collection

Forum members can either introduce a new topic ('first posts') or contribute to an ongoing discussion ('replies'). In the interest of simplicity and interpretability, only first posts were collected. Posts were copied and pasted into a text document ready

for subsequent text analysis. Where an individual member contributes multiple posts, these were combined into a single text document. All text files used in this study are hosted on Figshare, dx.doi.org/10.6084/m9.figshare.4743715). If a forum was further divided into sub-forums, only the single most appropriate sub-forum was used (See Appendix 3). For each test and control forum, we aimed to collect 30,000 words. Seven out of the 63 forums were not large enough to provide a 30,000-word corpus, but were nevertheless retained in the study as they surpassed 10,000 words. Posts were only collected if they met our selection criteria: (1) they must contain a minimum of 100 words, (2) be authored by a representative member of that online community (i.e. not written on behalf of someone else/news article etc.) and (3) written in continuous prose (i.e. not lists, poems). Posts from all test and control forums which met the selection criteria were collected sequentially as presented by the respective forum website (usually by date order). Posts were collected between April-May 2015 and December-January 2016. All data in this study was collected from the public domain, therefore while ethical consideration is still relevant, ethical approval and informed consent is not required. The aggregate data used in this study are hosted on Figshare, dx.doi.org/10.6084/m9.figshare.4743547.v1.

2.3.3 Word count text analysis

Word counting text analysis was conducted using validated dictionaries that characterize a particular linguistic dimension (i.e. negative words, auxiliary verbs, family related words). For this study, we validated an absolutist and a non-absolutist words dictionary using independent expert judges.

Absolutist and non-absolutist words indicate magnitudes or probabilities; absolute words do so without nuance (i.e. always, totally, entire) while non-absolute words indicate some degree of nuance (i.e. rather, somewhat, likely). Both dictionaries are comprised of functional words devoid of valence, mostly adverbial intensifiers or modal verbs. A subclass of non-absolutist words, which we have termed 'extreme words', indicate extreme (but not absolute) magnitudes or probabilities (i.e. "very"). While the terms extreme and absolute have previously been used interchangeably (e.g. Teasdale, et al., 2001), we treat them here as qualitatively distinct.

To construct these dictionaries, we initially brainstormed over 300 absolutist words and 200 non-absolutist words (including extreme words). Testing on pilot data (control and test groups), revealed that many of the words on these original lists were too obscure to register with sufficient frequency for analysis. Consequently, the original dictionaries were reduced to the most prevalent 22 absolutist words and 43 non-absolutist words (including 21 extreme words). While this was based on a mostly arbitrary cut off, it was intended that the lists be large enough to produce representative dictionary percentages, but small enough to facilitate independent validation by experts. The 22 absolutist words and 43 non-absolutist words were combined into a single list of 65 words (Appendix 4). Five independent expert judges were asked to categorize them as absolute, non-absolute and/or extreme. Two of the judges are clinical psychologists from The University of Reading Charlie Waller Institute and three are linguists from The University of Reading School of Clinical Language Sciences. Judges were permitted to place words into more than one category (i.e. extreme and absolute). The agreement between our original

categorization of the words (absolutist/non-absolutist) and that of the judges ranged between 83-94% while the inter-judge agreement was 96%. Words were considered absolute, extreme or non-absolute based on a majority decision by the judges. Three words '*anything*', '*need*' and '*needed*' were moved from the absolutist dictionary to the non-absolutist dictionary as they were not categorized as absolute by the majority of judges. All the words on our non-absolutist dictionary were judged non-absolute. Judges showed almost no agreement on extreme words, this category was consequently removed from the analysis (collapsed into the non-absolutist category).

The resulting 19-word absolutist dictionary is shown in Table 2.2. Both dictionaries were used in the text analysis of test and control groups. We also ran dictionaries contained within the LIWC program (Pennebaker, Mehl & Niederhoffer, 2003). This program provides 73 validated dictionaries covering a wide range of 'dimensions' (i.e. questioning words, affective processes, auxiliary verbs). All dictionaries, other than the absolutist dictionary, were run purely for the benefit of comparison.

The LIWC text analysis software was used to test our absolutist and non-absolutist dictionaries as well as the LIWC dictionaries. It calculates the prevalence of a given dictionary as a percentage of the total number of words analysed. Throughout, we have referred to this percentage measure of a dictionary's prevalence as its 'index'. In each forum, we calculated an index for 75 dictionaries (1 absolute, 1 non-absolute and 73 LIWC).

For the absolutist index, we have endeavoured to account for false positives. There are three principal types of false positives; a negation before the absolutist word (i.e. "not completely"), a qualifier before the absolutist word (i.e. "almost

completely") or a salutation (i.e. "hello everyone"). These would ordinarily register on our absolutist index and distort our measure of absolutism. Fortunately, the LIWC (2015 version) can also count phrases, so we ran a second version of our absolutist dictionary comprised of the most common false positives (as described, see Appendix 5). The absolutist false positive index was subtracted from the absolutist index to provide a better estimate of absolutism. We nevertheless rely on the assumption that any remaining false positives are equally distributed between groups.

Table 2.2 List of 19 Independently Validated Absolutist Words

	Absolutist Words
1	absolutely
2	all
3	always
4	complete
5	completely
6	constant
7	constantly
8	definitely
9	entire
10	ever
11	every
12	everyone
13	everything
14	full
15	must
16	never
17	nothing
18	totally
19	whole

2.4 Results

2.4.1 Study 1

2.4.1.1 Data analysis. The control and test category forums were subdivided into groups as shown in Table 2.1. To analyse the data, a multilevel mixed-effects modelling approach was adopted (see Appendix 1 for the SPSS syntax script). This is the recommended analysis method for this type of data structure (Baayen, Davidson, & Bates, 2008). Members were nested within forums, and forums were nested within groups (i.e. depression). Because low-frequency words cannot be measured reliably at the members level, we used the forums as the subject's category. This is important in comparing the performance of different dictionary dimensions. Effect sizes (Cohen's *d*) were calculated from the t values produced by the mixed-effects model ($d = 2t/\sqrt{df}$). Mixed-effects models consider both fixed and random effects and can be used to assess the influence of the fixed effects on the dependent variables after accounting for some outside random effects. Residuals were weighted by the word count of each text file and all the analysis was conducted using IBM SPSS software (version 21). To correct for positive skew in the data, we used a log10(x +1) transformation, adding 1 to deal with 0 values (cf. Yamamura, 1999). We report raw values for descriptive statistics to facilitate a more intuitive understanding. The bootstrap procedure was also used to produce better estimates of *p*-values and confidence intervals (CI). This method is often recommended because it does not assume normally distributed data (Cumming, 2014). Bootstrapped confidence intervals (95%; bias-corrected and accelerated) were computed through 1,000 random resamples (with replacement) using the stratified sampling method, with forums as the strata variable.

2.4.1.2 Control group. There was no significant omnibus effect among the control groups as determined by a multilevel mixed effects model F(7, 11) = 0.754, p = .635 (Table 2.1 and see Appendix 3 for more information). Consequently, they were combined into a single 'control group'. Importantly, this suggests that the absolutist index is largely independent of content, as it demonstrates remarkably little variance across a wide range of very different discussion topics.

2.4.1.3 Multilevel mixed-effects model for the absolutist index. There was a large, significant difference in the absolutist index between the study 1 groups, as determined by a multilevel mixed-effects model $F(3,29) = 71.549$, $p < .001$. Using paired comparisons in the mixed-effects model, we compared the control group with each of the study 1 test groups to assess our first hypothesis. We also compared the suicidal ideation forum group with the remaining two test groups (anxiety and depression forums) to assess our second hypothesis. The mean absolutist index for the control forum group (M = .97%, SD = 0.11) was significantly lower than anxiety (M = 1.45%, SD = 0.10, $p < .001$, d = 3.24, 95% CI [.36, .52]), depression (M = 1.45%, SD = 0.10, $p < .001$, d = 3.14, 95% CI [.35, .52]) and suicidal ideation (M = 1.80%, SD = 0.14, $p < .001$, d = 4.56, 95% CI [0.72, 0.98]) test forum groups. Moreover, the suicidal ideation group was significantly greater than both anxiety ($p < .001$, d = 1.74, 95% CI [−0.54, −0.29]) and depression ($p < .001$, d = 1.71, 95% CI [−0.53, −0.29]) groups (Figure 2.1). These results are consistent with both of our study 1 hypotheses. Post hoc comparisons with a Bonferroni correction revealed that there was no significant difference between anxiety and depression forum group means (p = 1.00).

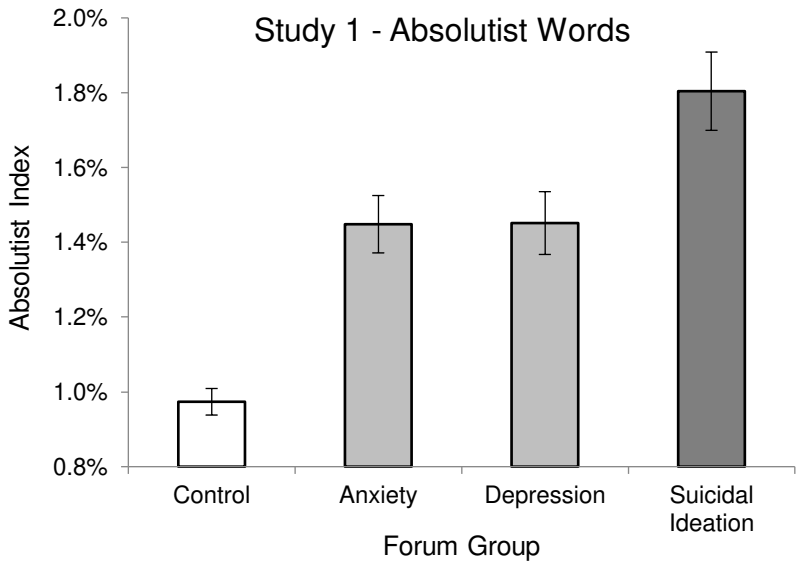

Figure 2.1 Mean percentage of absolutist words in study 1 groups. Error bars indicate ± 95% bootstrapped confidence intervals.

2.4.1.4 Multilevel mixed-effects model for the comparison dictionaries. Using the LIWC software, we produced indices for our non-absolutist dictionary and all 73 LIWC dictionaries. We were interested in determining which comparison dictionary index would produce comparable significance levels and effect sizes to that of our absolutist index. We again conducted a multilevel mixed-effects model and pairwise comparisons for each of the 74 comparison dictionary indices. Table 2.3 displays the test statistics and effect sizes for the 16 dictionaries with the largest effects. Notably, our absolutist index has satisfied the study hypotheses better than any of the linguistic dimensions previously linked to affective disorder (negative emotions, personal pronouns etc.). While 'negative emotion' words were predictably more prevalent in test group forums than control forums, they paradoxically were less prevalent in suicidal ideation forums than anxiety or depression forums. This was also the case for other content dictionaries like 'sad', affect' and 'feel'.

Table 2.3 Results for Study 1 Paired Comparisons, Displayed are 16 Dictionaries with the Largest Effects.

Dictionary	H_1						H_2			
	Control < Anxiety		Control < Depression		Control < Suicidal Ideation		Anxiety < Suicidal Ideation		Depression < Suicidal Ideation	
	d	*t*	*d*	*t*	*d*	*t*	*d*	*t*	*d*	*t*
Absolutist	3.24	8.57**	3.14	8.48**	4.56	12.43**	1.74	4.62**	1.71	4.60**
Death	1.95	5.02**	2.42	6.29**	8.08	21.37**	5.70	14.82**	5.28	13.82**
Anxiety	10.04	27.21**	2.68	7.37**	0.52	1.44	6.67	−18.27**	1.47	−4.06**
Neg. Emo	5.81	15.85**	4.36	11.98**	3.56	9.92**	1.05	−2.90*	0.05	−0.14
Sad	2.02	5.56**	5.18	14.38**	3.70	10.44**	1.78	4.96**	0.51	−1.43
Affect	4.47	12.18**	3.69	10.15**	3.23	9.03**	0.37	−1.02	0.15	0.41
Anger	2.43	6.65**	2.38	6.59**	3.54	9.94**	1.36	3.76*	1.35	3.77*
Certain	1.84	4.89**	2.02	5.43**	3.21	8.78**	1.51	4.07**	1.34	3.63*
Pronouns	2.53	6.96**	2.56	7.10**	2.90	8.12**	0.69	1.92	0.65	1.81
Insight	3.04	8.08**	2.69	7.24**	1.22	3.35*	1.08	−2.92*	0.87	−2.35*
Article	2.41	−6.57**	2.34	−6.43**	2.64	−7.35**	0.57	−1.57	0.60	−1.65
Swear	1.02	2.75*	0.98	2.67*	2.55	7.06**	1.49	4.08**	1.50	4.12**
Feel	2.32	6.36**	2.08	5.72**	1.17	3.27*	0.64	−1.78	0.48	−1.33
Function	1.75	4.83**	2.15	5.97**	2.01	5.63**	0.48	1.33	0.18	0.50
I	1.87	5.15**	1.95	5.37**	1.88	5.22**	0.27	0.74	0.21	0.57
Negate	0.77	2.13*	1.89	5.26**	1.95	5.49**	1.13	3.16*	0.32	0.9

Note. For each dictionary, three t-tests compared the transformed data for the control group index (dictionary % prevalence) to each of the test groups (anxiety, depression and suicidal ideation forums) to address H_1 = Hypothesis 1. Two t-tests also compared the suicidal ideation forum group with the remaining two test groups (anxiety and depression) to address H_2 = Hypothesis 2. LIWC dictionaries are ordered according to average Cohen's *d* effect size. 'Neg. Emo' = Negative emotions; 'I' = First person singular pronouns (e.g. *I, me, my*). *p < .05. **p < .001

2.4.1.5 Analysis of covariance. We ran an analysis of covariance (ANCOVA) to measure the unique predictive validity of absolutist words after partialling out the effects of the negative emotion words, pronouns, and certainty words. Negative emotions and pronouns have previously been identified as strong linguistic markers of affective disorder, and the certainty words index is the most conceptually related to our absolutist index. We found that there was still a significant main effect for the absolutist index between groups, after controlling for the certainty index, negative emotions index and the pronoun's index, $F(3, 3860) = 20.575$, $p < .001$). Paired comparisons reveal that all contrasts remained significant to $p < .01$.

2.4.1.6 Confirmatory factor analysis. For study 1 forums, we calculated indices for each individual *word* in the absolutist and non-absolutist dictionaries using an in-house python script (see Appendix 2 for full python code) and the Natural Language Tool Kit (NLTK; Bird, Klein & Loper, 2009). This means that we had the percentage prevalence of each *word* rather than each dictionary. Using these data, we conducted a confirmatory factor analysis on the combined list of 65 absolutist and non-absolutist words with a Direct Oblimen rotation and a loadings cut-off > 0.55. We found that the highest loading words on the first factor were all absolutist except for '*really*' (which is an adverbial intensifier) and '*anything*' which we had originally categorized as absolutist but due to lack of independent expert validation, was moved to the non-absolutist dictionary. The highest loading words on factor 2 were all non-absolutist except for the absolutist word '*definitely*'. Other than '*definitely*', no absolutist word loaded outside of factor one. The factor analysis was not able to separate 'extreme words' from non-absolutist words (see Table 2.4). To examine the absolutism factor

further, we used structural equation modelling (SEM) to test the model fit of the 7 highest loading words on factor 1 from the factor analysis. Model fit was assessed using AMOS version 24 (SPSS). A 7-item, one factor model adequately fit the data (X^2 = 14.461, $X^{2/\text{degrees of freedom}}$ [df] = 14, GFI = .912, CFI = .996, NFI = .903). Including more words in the model reduced the model fit below generally accepted levels.

2.4.1.7 Sensitivity analysis. The smallest group in this study is the suicidal ideation group. Inferences about this group are based on data from 368 members in four separate suicidal ideation forums. Moreover, these forums may be perceived as less conventional than others used in this research. For this reason, we conducted a sensitivity analysis to ensure the results obtained from this group are robust. The multi-level mixed-effects model for the absolutist index was recalculated after sequentially excluding all data from each of the suicidal ideation forums in turn. This produced four sets of test statistics, each with one suicidal ideation forum excluded. Paired comparisons showed that the absolutist index for the suicidal ideation group remained significantly greater than the control group (*p's* < .001, *d's* = 3.85-4.41), the anxiety group (*p's* < .001, *d's* = 1.39-1.71) and the depression group (*p's* < .001, *d's* = 1.37-1.69). The narrow range of effect sizes for each comparison confirms that these findings are robust, and not driven by a forum outlier in the suicidal ideation group.

Table 2.4 Highest Loading Words in the Confirmatory Factor Analysis.

	Components	
FACTORS	**1**	**2-5**
everything	0.864	
ever	0.725	
always	0.717	
nothing	0.684	
anything[a]	0.68	
never	0.634	
really[b]	0.602	
completely	0.594	
every	0.559	
about		0.677
huge		0.636
generally		0.625
often		0.611
some		0.602
somewhat		0.589
slight		0.576
might		0.576
definitely[c]		0.573
nearly		0.562

Note. Individual absolutist and non-absolutist words factored according to their study 1 forums indices. [a] Italicized word not categorized as absolutist by independent expert judges. [b] Italicized word not categorized as absolutist by independent expert judges. [c] Italicized word categorized as absolutist by independent expert judges.

2.4.2 Study 2

2.4.2.1 Multilevel mixed-effects model for the absolutist index. Our third hypothesis predicted that mental health forum groups strongly associated with absolutist thinking (BPD and ED) would use more absolutist words than mental health forum groups less associated with absolutist thinking (PTSD and schizophrenia). A multilevel mixed-effects analysis found that there was a significant difference in the absolutist index between study 2 groups $F(3,16) = 5.515$, $p = .009$. Paired comparisons revealed that the mean absolutist index for the BPD forum group (M = 1.47, SD = 0.12) was significantly greater than the PTSD (M = 1.13, SD = 0.07, $p < .001$, $d = 1.93$, 95% CI [−0.38, −0.14]) and the schizophrenia forum groups (M = 1.14, SD = 0.10, $p < .001$, $d = 1.94$, 95% CI [−0.42, −0.20]). They also revealed that the absolutist index of the ED forum group (M = 1.25, SD = 0.12) was significantly greater than the schizophrenia ($p = .009$, $d = .81$, 95% CI [−0.25, −0.05]) but not PTSD ($p = .081$, $d = .84$, 95% CI [−0.22, 0.01]) forum groups (Figure 2.2). A critical assumption in this contrast, is that the control and test groups have similar levels of psychological distress. We sought to verify this assumption using the LIWC negative emotions dictionary. A paired comparison found no significant difference in the mean negative emotions index between the study 2 control (M = 3.51, SD = 0.73) and test (M = 3.71, SD = 0.31, $p = .335$) forum groups (Figure 2.2). Therefore, it seems that absolutism is associated with certain types of psychopathology forums and not psychological distress forums *per se*.

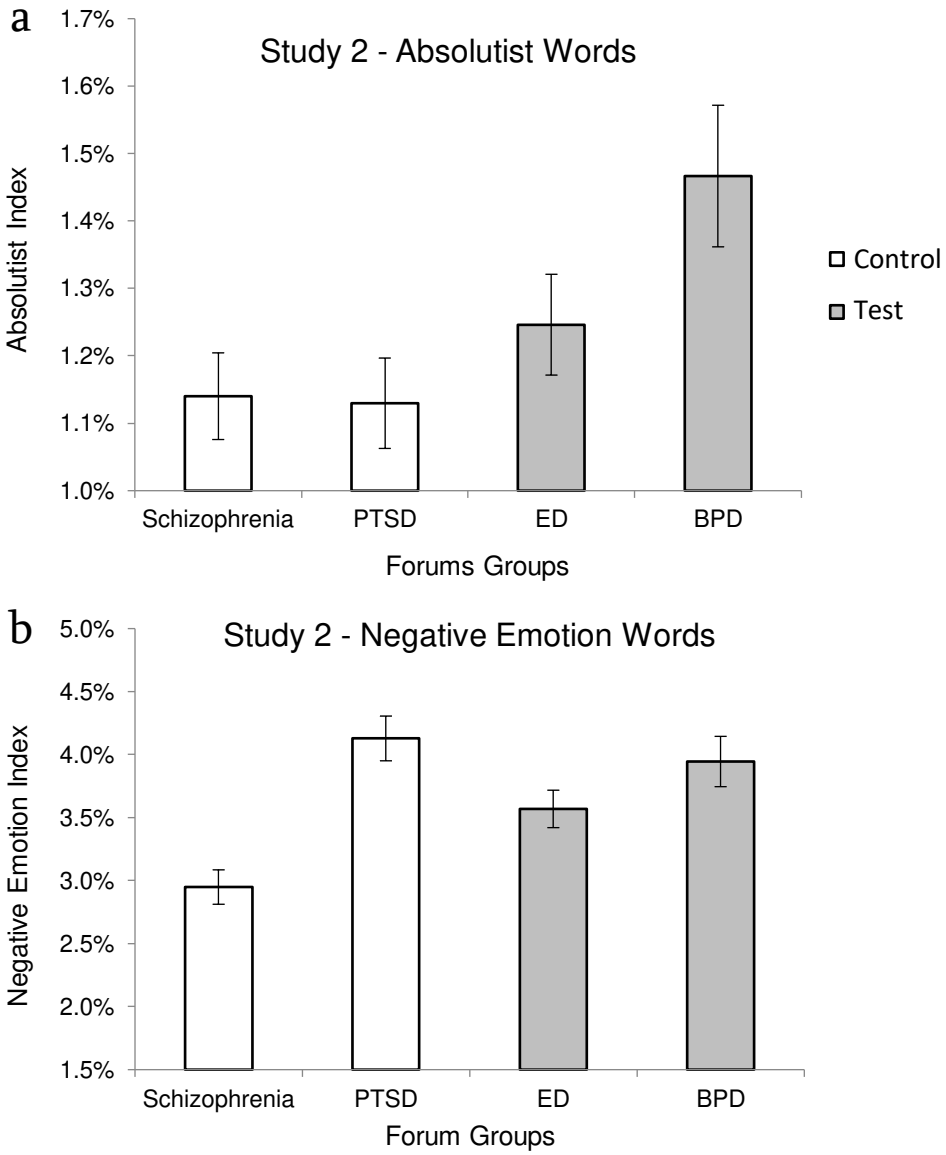

Figure 2.2 Mean percentage of (a) absolutist words in study 2 groups (b) negative emotion words for study 2 groups. Error bars indicate ± 95% bootstrapped confidence intervals. PTSD = Post Traumatic Stress Disorder, ED = Eating Disorder, BPD = Borderline Personality Disorder.

2.4.2.2 Comparison of study 1 with study 2. In comparing the absolutist index of study 1 and 2 groups, post hoc comparisons with a Bonferroni correction revealed that the suicidal ideation forum group had an index significantly greater than ED and BPD forum groups ($p < .001$). ED but not BPD had an index significantly lower than anxiety and depression forum groups (p's = .001). Study 2 control forum groups PTSD and schizophrenia had an index significantly lower than all study 1 test forum groups (p's < .001).

2.4.2.3 Sensitivity analysis. The smallest group in this study is the BPD group. Inferences about this group are based on data from 326 members in four separate BPD forums. This group also produced the most extreme absolutist index scores. Once again, we conducted a sensitivity analysis to ensure the results obtained from this group are robust. The multi-level mixed-effects model for the absolutist index was recalculated after sequentially excluding all data from each of the BPD forums in turn. This produced four sets of test statistics, each with one BPD forum excluded. Paired comparisons show that the absolutist index for the BPD group remained significantly greater than the PTSD group (p's < .026, d's = 1.25-1.91) and the schizophrenia group (p's < .008, d's = 1.56-2.24). Once again, the positive findings from the smallest group in the study appear to be robust and not dependent on any single forum outlier.

2.4.3 Study 3

2.4.3.1 Multilevel mixed-effects model for the absolutist index. Our final hypothesis predicted that the recovery forum group would use significantly more absolutist

words than the study 1 control forum group. Paired comparisons in a multilevel mixed-effects model found that the mean absolutist index of the recovery forum group (M = 1.31%, SD = 0.14) was significantly greater than the study 1 control forum group (p < .001, 95% CI [−0.41, −0.24], d = 2.02). Paired comparisons also found a significant difference in the absolutist index between the recovery forum group and the anxiety group (p = .018, 95% CI [−0.01, 0.23], d = .56) and depression group (p = .018, 95% CI [−0.01, 0.22], d = 0.52). Like the anxiety and depression groups, the recovery group also had a significantly lower absolutist index than the suicidal ideation group (p < .001, 95% CI [−0.37, −0.67], d = 2.31). Although the absolutist index of the recovery group was significantly different from anxiety and depression groups, the more accurate bias corrected confidence intervals reveal that the differences are marginal; relative effect sizes reveal that the recovery group absolutist index is closer to anxiety and depression (d's < 0.56) than to the control group (d = 2.02; Figure 2.3). We noted earlier that the contents of the recovery forums were very positive. To illustrate this fact, we ran the LIWC positive emotions dictionary on the above groups (Figure 2.3). There was indeed a very large difference in the prevalence of positive emotions. Paired comparisons found that the recovery forum group contained more positive emotion words than all the remaining groups (p's < .001).

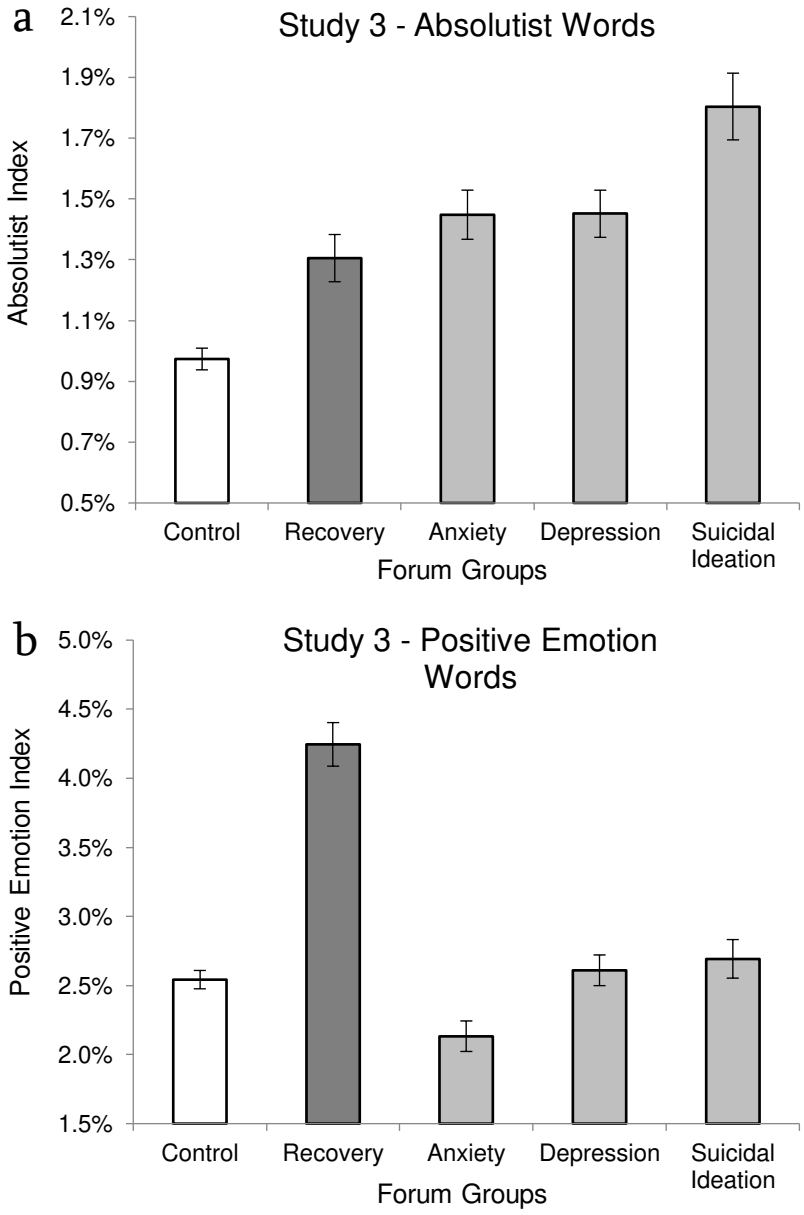

Figure 2.3 Mean percentage of (a) absolutist words (b) positive emotion words, for the recovery group and all study 1 groups (control, anxiety, depression, suicidal ideation). Error bars indicate ± 95% bootstrapped confidence intervals.

2.4.3.2 Sensitivity analysis. Although the recovery group is relatively large, with 558 members in 7 different forums, this group is somewhat unconventional and the number of members in each forum were somewhat unequal (see Appendix 3). We therefore deemed it appropriate to conduct another sensitivity analysis to ensure the results obtained from this group are robust. The multi-level mixed-effects model for the absolutist index was recalculated after sequentially excluding all data from each of the recovery forums in turn. This produced seven sets of test statistics, each with one recovery forum excluded. Paired comparisons show that the absolutist index for the recovery group remained significantly greater than the control group (*p's* < .001, *d's* = 1.88-2.30). This again confirms that the positive findings from this group are robust and not dependent on any single forum outlier.

2.5 Discussion

2.5.1 Main Findings

The data we have presented confirms that the use of absolutist words is elevated in the natural language of various affective disorder forum groups. As expected, in study 1 we found that the percentage of absolutist words in anxiety, depression and suicidal ideation test groups was significantly greater than control groups (H_1); and that the percentage of absolutist words in the suicidal ideation forum group was significantly greater than in both the anxiety and depression forum groups (H_2). These findings have support from a previous study, Fekete (2002) used an adapted Weintraub text analysis method on four internet forums (suicide, depression, anxiety and a journalism control). They found significant results for 13 language variables including negations and dichotomous expressions. Our first study has built on this preliminary finding,

using a wider range of more rigorous controls, a larger corpus of data and a hypothesis driven study design.

In study 2, consistent with our expectations, we found the absolutist index was greater for BPD and ED forums than PTSD and schizophrenia forums; although this did not reach significance between ED and PTSD. All four mental health groups contained similar amounts of negative emotion terms, but only BPD and ED are strongly associated with absolutist thinking. This suggests that our index is more sensitive to absolutism than psychological distress.

In study 3, we proposed that if the absolutist index for the recovery forums was similar to depression forums, this would suggest that absolutist thinking has some trait like qualities that persist outside of depressive episodes. This is indeed what we observed. Even though the recovery forums were largely very positive, the percentage of absolutist words in the recovery group had overlapping confidence intervals with both the anxiety and depression forum groups, and was significantly greater than the control forum group. It is widely acknowledged that an episode of depression increases the risk of future depressive episodes (Teasdale et al., 2000). In many ways, preventing this recurrence is the focus of most treatments. Consequently, there is keen interest in identifying potential cognitive vulnerability factors which are observed during episodes of depression and persist even after the episode has ended. Our findings indicate that absolutism may be such a vulnerability factor. The 'scar hypothesis' (Lewinsohn, Steinmetz, Larson & Franklin, 1981) provides a different explanation. Here the depressive episode itself alters the linguistic style/vocabulary of the individual, this then persists as a 'scar' after the depressive episode has abated.

2.5.2 Comparison with other dictionaries

Text analysis research on written data from depressed and suicidal individuals has repeatedly shown elevated use of negative emotion words and pronouns (for review see Tausczik & Pennebaker, 2010). We also found these to be strong markers of affective disorder in the present study. However, we have paradoxically found that 'negative emotions', 'sad', 'affect' and 'feel' dictionaries, were more prevalent in anxiety and depression than the suicidal ideation group. This is inconsistent with the belief that suicidal individuals have a greater amount of negative emotions (de Klerk et al., 2011; Orbach, Mikulincer, Gilboa-Schechtman, & Sirota, 2003; Stein, Apter, Ratzoni, Har-Even & Avidan, 1998). While some research has previously shown that 'negative emotion [words] use tends to increase approaching suicide' (Pennebaker & Chung, 2013). These mixed findings only reaffirm that 'function' words are a better gauge of thinking processes than 'content' words (Chung & Pennebaker, 2007). Our absolutist dictionary also produced larger effects than pronouns (and its first person singular subcategory), which had previously been identified as better markers of affective disorder than negative emotion words (Pennebaker & Chung, 2013).

The LIWC 'certainty' index (Table 2.3) is the most closely related to our absolutist index, comprising words that denote high or total certainty. While indeed similar, the certainty index does not include some words which are absolutist (i.e. 'nothing') and contains others which are not (i.e. 'frankly'). Moreover, unlike our absolutist dictionary, many of its component words are not neutrally valenced (i.e. perfect).

Finally, we found that 'swear' words produced a similar significance pattern to absolutist words (Table 2.3). Swear words are commonly used as adverbial

intensifiers (Peters, 1994; Romero S, 2012). For example, instead of writing 'I'm *completely* sick of this', depressed/suicidal individuals may write something akin to 'I'm *fucking* sick of this', replacing the absolutist word 'completely' with something even more forceful; both functionally serving as adverbial intensifiers of the strongest kind.

2.5.3 Absolute vs. Extreme

Previous studies have often used the terms absolute and extreme interchangeably (e.g. Teasdale et al., 2001). A central assumption in the present research is that absolutist words are uncorrelated with extreme words; this assumption was tested. We found that only 25% of absolutist words were also deemed extreme by some of the independent expert judges. Moreover, none of the words we had categorized as extreme were deemed absolutist, with the single exception of '*really*' which was categorized as absolutist by one out of the five judges. This was reaffirmed by the confirmatory factor analysis (Table 2.4), in which only words we had categorized as absolutist loaded onto factor one, with the single exception, once again, of the adverbial intensifier '*really*'. We believe that a clear distinction should be made between these two concepts in future research; and that the terms should not be used interchangeably.

2.5.4 Anxiety and depression within control groups

Individuals with cancer, PTSD and schizophrenia have high levels of comorbid anxiety and depression. This might lead us to expect a higher absolutist index for these forum groups. However, the cancer group produced an absolutist index identical to the

other study 1 control groups; and the PTSD and schizophrenia groups had a significantly lower absolutist index than all study 1 test groups. This may be because symptoms of anxiety and depression in cancer, PTSD and schizophrenia have a known specific cause, namely, having cancer, PTSD or schizophrenia. One does not have to be absolutist, or even disposed to affective disorder, to experience feelings of anxiety or depression about a brain tumour, a traumatic event, or hallucinations. In contrast, anxiety and depression disorders often have multiple vague or even unknown causes. Predisposed individuals are pushed into anxiety and depression by circumstances which by necessity would not have the same effect in the general population.

2.5.5 Implications.

The maladaptive status of absolutist thinking is a recognized part of cognitive therapy (CT; Williams & Garland, 2002). To date, theoretical and anecdotal support has mostly served as the basis for its inclusion, we hope the findings from our studies will add empirical justification. The extent to which absolutist thinking is currently addressed by CT, depends on the form of CT used, and the preferred methods of each practitioner. For example, combatting absolutist thinking is at the very core of Rational-Emotive Behavioural Therapy (REBT; David, Lynn & Ellis, 2009), whereas reducing negative thoughts takes primacy in other forms of CT. Recently, research into treating cognitive vulnerabilities and preventing relapse has migrated towards the new 'third wave' therapies (Teasdale et al., 2000). These therapies, such as Mindfulness-Based Cognitive Therapy (MBCT) and Acceptance and Commitment Therapy (ACT) are largely geared towards increasing cognitive flexibility (e.g. Kahl, 2012). Our findings are therefore in step with the recent trend towards cultivating

adaptive cognitive *processes* (i.e. flexibility) as distinct from changing the *content* of thoughts (i.e. negativity).

2.5.6 Measuring absolutism

In this chapter we have measured absolutist thinking using natural language text analysis. Previous efforts to measure absolute thinking have relied on totalling the number of end-point responses on Likert scales. Compared to using natural language text analysis this method has significant drawbacks which centre around three areas. Firstly, there has been no work which demonstrates that an absolute response style on Likert scales actually corresponds to absolute thinking (akin to study 2 detailed above). Secondly, the content of the items on the different questionnaires, often confound the nature of an absolute response. For instance, is an absolute response to a moderate question truly absolute? Moreover, the end-points are sometimes labelled with non-absolutist quantifiers (e.g. "strongly agree"). Finally, measuring absolute thinking through Likert scales lacks ecological validity. In chapter 5, we will identify natural language markers which correspond to absolute responses on Likert scales. This will show where the two methods overlap and where they depart, moreover, it may give insights into the construct validity of measuring absolute responding on Likert scales. We also hope to encourage other researchers to use the natural language surrogates for absolute responding on Likert scales we identify in conducting their investigations.

2.5.7 Limitations and future directions.

Because this study had large samples from multiple sources, and a naturalistic

observational design, it consequently had low experimental control. For example, we could only infer general demographic characteristics from different forums (e.g. women post on Mumsnet and young people post on Student Room etc.). Usernames served to distinguish members, however it is possible that some members might post using more than one profile or use different usernames for different forums. Fundamentally, the identities and motivation of users is largely unknowable, and this is an inevitable limitation in this study. As outlined in the methods, we did check that the authors of posts were at least purporting to be a representative of the relevant online community, but we had no power to go beyond this basic check. Follow-up studies could use an experimental study design, and perhaps alternative methodologies, to replicate and extend the findings initially presented here. Despite likely being limited to a smaller sample size and perhaps lacking ecological validity, such studies would be able to control participant characteristics, writing topics and the setting.

Our findings in this study relate to differences between-groups, such an analysis provides important insights into the markers associated with affective disorder. However, in this research, we have not addressed within-person variation in absolutist thinking and how that relates to changes in affective symptoms at an individual level (c.f. Molenaar and Campbell, 2009). For example, are individual changes in suicidal ideation over time reflected in changes in use of absolutist words? Future research could seek to track absolutist thinking (and affective disorder) in individuals over time. This could have even greater utility for clinical practice.

In measuring aggregate differences in absolutist words between groups we have not examined the specific nature of the relationship. While we present data,

which may point to absolutism as a possible cognitive vulnerability factor, the extent and mechanism of any causal role is not addressed here. Future intervention studies could examine the causal status of absolutist thinking, one possibility would be to use a cognitive bias modification paradigm (Hallion & Ruscio, 2011). The aim would be to introduce some manipulation of absolutist thinking in participants and then examine the subsequent effects. Alternatively, a narrow form of CBT which focussed on targeting absolutist thinking could be clinically trialled.

2.5.8 Author Contributions

M. Al-Mosaiwi created the research design from an initial idea contributed by T. Johnstone. M. Al-Mosaiwi collected, ana-lyzed, and interpreted the data under the supervision of T. Johnstone. M. Al-Mosaiwi drafted the manuscript, and T. Johnstone provided critical revisions.

Chapter 3: Replication of Study 1 in Four Other Languages

3.1 Chapter Overview

In a follow-up replication study for chapter 2, we located German, French, Russian and Spanish depression and suicidal ideation forums. Our aim was to replicate and extend our main findings above in other languages and cultures. We show that absolutist words continue to be strong markers for affective disorder in all the languages and cultures tested. They produced larger effect sizes than pronouns. However, we did not find differences in the percentage prevalence of absolutist words between depression and suicidal ideation, in any language except English.

3.2 Introduction

Text analysis research has consistently found that pronouns (e.g. 'I', 'myself', 'you') and negative emotion words (e.g. 'hate', 'depressed', 'unhappy') were the strongest markers for depression in natural language text (Rude, Gortner and Pennebaker, 2004). Subsequently, our lab examined the role of absolutist words (e.g. 'always', 'nothing', 'completely' etc.) as possible markers in the natural language of affective disorder. We define absolutist words, as those which denote totality, either of magnitude or probability, and are unqualified by nuance. We collected natural language text from anxiety, depression and suicidal ideation internet forums; finding that anxiety and depression forums contained approximately 50% more absolutist words than control forums (e.g. Mumsnet, Student room, Cancer forums etc.). Moreover, suicidal ideation forums contained approximately 75-80% more absolutist

words than control forums. Interestingly, absolutist words were stronger markers of affective disorder natural language than pronouns. They also tracked the severity of affective disorder forums more faithfully than 'negative emotion' words, as the latter was found to be paradoxically lower in suicidal ideation forums than anxiety and depression forums (Al-Mosaiwi and Johnstone, 2018).

Our research was confined to using English absolutist words, and analyzing English language forums. We do not know whether absolutist words continue to be strong markers for the natural language of depression and suicidal ideation, in other languages and other cultures. If the effect does not generalize to other languages, we should infer that absolutist words are not a universal linguistic feature of affective disorder. Our previous findings may therefore be specific to English speaking culture, or a quirk of the English language. We predict not, our expectation is that regardless of language and culture, absolutist words will continue to be strong linguistic markers for depression and suicidal ideation natural language.

In this study, we seek to demonstrate the effect in 4 other languages; namely, German, French, Russian and Spanish. We chose these languages because they spanned across different cultures, and we were confident of finding suitable forums for them. For each language, we focused on locating adequate internet discussion forums for control, depression and suicidal ideation conditions.

As with Al-Mosaiwi and Johnstone (2018), we have used the Linguistic-Inquiry and Word Count software (LIWC; Pennebaker, Booth, Boyd, & Francis, 2015) to conduct the text analysis. This program provides 73 independently validated dictionaries covering a wide range of 'dimensions' (e.g. negative emotion words, family words, pronouns). We ran the LIWC pronouns and negative emotions

dictionaries, to compare absolutist words with these already known markers for affective disorder. There has been at least one previous foreign language replication of this type (although it did not examine absolutist words). Ramirez-Esparza, Chung, Kacewicz and Pennebaker (2008) found that negative emotion words and first person singular pronouns were the strongest markers of natural language in Spanish depression forums (as opposed to control breast cancer forums).

3.3 Method

3.3.1 Forum Selection.

Representative websites were located through a Google search (search words: e.g. "depression forums"). These search terms were first translated into the relevant language (e.g. German) in order to find forums in that language. Forums were google translated into English and inspected to ensure suitability. Forums were included into the study if they were deemed to deal with the relevant topic (e.g. depression), contain natural language text, and posts must be authored by representative members of that group (e.g. depressed users)

We aimed to recruit six forums for each group (control, depression and suicidal ideation) in each language. We struggled to locate suicidal ideation forums, only finding one for each of the languages. We failed to find any suicidal ideation forums in Spanish, therefore Spanish only had two conditions (control and depression). In French, we could only locate five depression forums, and so we collected five control forums to match. The control forums covered topics such as parenting, gardening, being a student, being a pensioner, men's forums, work forums,

health forums and general practical forums (see Appendix 6 for full details and website addresses for control, depression and suicidal ideation forums).

3.3.2 Data Collection.

Forum members can either introduce a new topic ('first posts') or contribute to an ongoing discussion ('replies'). In the interest of simplicity and interpretability, only first posts were collected. Posts were copied and pasted into text documents ready for subsequent text analysis. All text files used in this study are hosted on Figshare, dx.doi.org/10.6084/m9.figshare.4743715). If a forum was further divided into sub-forums, only the single most appropriate sub-forum was used (see Appendix 6). Where a member makes multiple posts, these were combined into a single text document.

For each control, depression and suicidal ideation forum, we aimed to collect 30,000 words. Sixteen out of the forty-nine forums were not large enough to provide a 30,000-word corpus, but were nevertheless retained in the study as they surpassed 10,000 words. Posts were only collected if they met our selection criteria: (1) they must contain a minimum of 100 words, (2) be authored by a representative member of that online community (i.e. not written on behalf of someone else/news article etc.) and (3) written in continuous prose (i.e. not lists, poems). Posts from all depression and control forums which met the selection criteria were collected sequentially as presented by the respective forum website (usually by date order). All data in this study was collected from the public domain, therefore while ethical consideration is still important, informed consent is not required. This complies with the University of Reading research ethics guidelines, and the ethical guidance for internet-mediated

research set out by The British Psychological Society (British Psychological Association, 2013). The aggregate data used in this study are hosted on Figshare, dx.doi.org/10.6084/m9.figshare.4743547.v1.

3.3.3 Text Analysis.

Word counting text analysis was conducted using validated dictionaries that characterize a particular linguistic dimension (i.e. negative words, auxiliary verbs, family related words). For this study, we used our in-house absolutist dictionary, which has been validated by independent expert judges (two clinical psychologists and three linguists from The University of Reading). The dictionary is made up of 19 absolutist words (Table 2.2) and was previously used to define absolutist words in Al-Mosaiwi and Johnstone (2018). For this study, we translated the English language absolutist dictionary into German, French, Russian and Spanish. This was achieved in two stages; in the first stage the absolutist words were translated using Google translate software, this translation was then refined through consultation with native speakers in the second stage. The resultant dictionaries can be found in Appendices 7-10. The LIWC program also contains validated pronouns and negative emotions dictionaries, which they have translated into German, French, Russian and Spanish. Purely for comparison, we will also test these dictionaries to compare absolutist words with other well-known markers for the natural language of depression. The pronoun dictionary has pronoun subcategories (e.g. first person singular, personal pronouns, third person pronouns), we will also run these subcategories and compare absolutist words to the pronoun subcategory which produces the largest average effects. For each language, the LIWC text analysis software was used to test the various

dictionaries. It calculates the prevalence of a given dictionary as a percentage of the total number of words analysed. We have referred to this percentage measure of a dictionary's prevalence as its 'index'. For every text document, we calculated an index for each of the linguistic dimensions.

3.3.4 Data Analysis.

The data from each language was analysed separately and a multilevel mixed-effects modeling approach was adopted (see Appendix 1 for the SPSS syntax script). This is the recommended analysis method for this type of data structure (Baayen, Davidson, & Bates, 2008). Members were nested within forums, and forums were nested within groups (i.e. depression). Mixed-effects models consider both fixed and random effects and can be used to assess the influence of the fixed effects on the dependent variables after accounting for some outside random effects. Residuals were weighted by the word count of each text file and all the analysis was conducted using IBM SPSS software (version 21). To correct for positive skew in the data, we used a log10(x +1) transformation, adding 1 to deal with 0 values (cf. Yamamura, 1999). We report raw values for descriptive statistics to facilitate a more intuitive understanding. The bootstrap procedure was also used to produce better estimates of *p*-values and confidence intervals (CI). This method is often recommended because it does not assume normally distributed data (Cumming, 2014). Bootstrapped confidence intervals (95%; bias-corrected and accelerated) were computed through 1,000 random resamples (with replacement) using the stratified sampling method, with forums as the strata variable.

3.4 Results

3.4.1 Prevalence of absolutist words.

We conducted a mixed effects model for the German, French, Russian and Spanish absolutist indices. We found a large and significant difference between forum conditions (control, depression, suicide) for the German $F(2,9) = 11.848$, $p = .003$), French $F(2,7) = 5.541$, $p = .036$) and Russian $F(2,6) = 24.62$, $p < .001$) absolutist indices. For the German forums (Figure 3.1), paired comparisons found that the control group ($M = 1.34$, $SD = .84$) contained a significantly lower percentage prevalence of absolutist words than depression ($M = 2.03$, $SD = 1.10$; $p < .001$, $d = 2.96$, 95% CI [.06, .17]) and suicidal ideation ($M = 2.08$, $SD = .94$, $p < .001$, $d = 1.71$, 95% CI [.02, .21]) forums. There was no significant difference between suicide and depression forums ($p = .807$, 95% CI [-.10, .10]). For the French forums (Figure 3.1), paired comparisons also found that the control group ($M = 1.13$, $SD = .65$) contained a significantly lower percentage prevalence of absolutist words than depression ($M = 1.54$, $SD = .91$; $p < .001$, $d = 2.26$, 95% CI [.02, .13]) but not suicidal ideation ($M = 1.54$, $SD = .74$, $p = .094$, $d = 1.51$, 95% CI [.02, .17]) forums. There was no significant difference between suicide and depression forums ($p = .879$, 95% CI [-.09, .09]). For the Russian forums (Figure 3.1), paired comparisons also found that the control group ($M = .84$, $SD = .60$) contained a significantly lower percentage prevalence of absolutist words than depression ($M = 1.54$, $SD = .82$; $p < .001$, $d = 4.77$, 95% CI [.10, .19]) and suicidal ideation ($M = 1.56$, $SD = .91$, $p < .001$, $d = 3.04$, 95% CI [.05, .23]) forums. There was no significant difference between suicide and depression forums ($p = .856$, 95% CI [-.09, .09]). Finally, we found a large and significant difference in the percentage of absolutist words between control ($M = 0.93$, $SD = .70$) and depression ($M = 1.55$, SD =

.91; $p < .001$, $d = 2.90$, 95% CI [.06, .17]) Spanish forums (Figure 3.1; there was no Suicidal ideation forum).

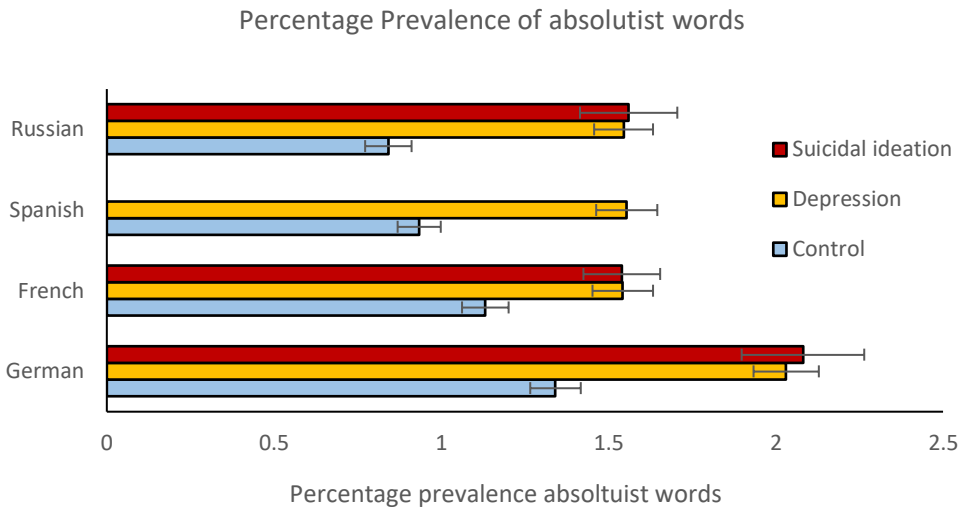

Figure 3.1 Precentage prevalence of absolutist words in German, Spanish, French and Russian language depression, suicidal ideation and control internent forums.

3.4.2 Negative emotion words and Pronouns.

The LIWC software provides validated dictionaries for the linguistic categories of negative emotion words and pronouns (including subcategories). These LIWC dictionaries are also available in a range of languages including German, French, Russian and Spanish, which we used in this study. Using the LIWC, we calculated the percentage prevalence of these dictionaries in the control, depression and suicidal ideation forums. In addition to confirming that negative emotion words and pronouns serve as linguistic markers for depression and suicidal ideation, in languages other than English, we also sought to compare their effects with those of absolutist words. We again conducted a multilevel mixed-effects model and pairwise comparisons for each linguistic marker. Table 3.1 displays the test statistics and effect sizes for the 3

dictionaries in each of the four languages tested. Of the various pronoun dictionaries, we found that first person singular pronouns (I, me, mine) produced the largest average effects, therefore we will compare the effects of the absolutist dictionary to this pronoun subcategory. First person singular pronouns produced large and significant differences between control and depression forums (p's < .05, d's > 1.49) but not for control and the suicidal ideation forum (p's > .05, d's > .84; excluding the Spanish language). Negative emotion words also produced large and significant differences between control and depression forums (p's < .05, d's > 2.80) as well as control and the suicidal ideation forum (p's < .05, d's > 1.91; excluding the Spanish language). Therefore, both these linguistic dimensions appear to be strong markers for the natural language of depression and suicidal ideation, in other languages besides English. Nevertheless, we found that absolutist words produced larger effects than pronouns in every language tested, this is consistent with the findings reported previously by Al-Mosaiwi and Johnstone (2018) for English forums (Table 2.3). We therefore again conclude that absolutist words are stronger markers of depression and suicidal ideation natural language than pronouns (which had previously been considered the strongest markers). Negative emotion words did produce larger effects than absolutist words and this is also consistent with the findings reported in Al-Mosaiwi and Johnstone, (2018).

Table 3.1 Test Statistics and Effect Sizes for each Language

Dictionary	H_1 Control < Depression		H_1 Control < Suicidal Ideation		H_1 Depression < Suicidal Ideation	
	d	*t*	*d*	*t*	*d*	*t*
Absolutist Words						
German	2.96	4.67**	1.71	2.60*	.04	.06
French	2.26	3.17*	1.51	1.95	.03	.04
Russian	4.77	6.77**	3.04	3.80*	.06	.07
Spanish	2.90	4.53**				
I						
German	1.63	2.57*	.99	1.56	.12	.19
French	1.49	2.11*	0.84	1.18	.03	.04
Russian	4.47	7.03**	2.59	3.90*	.04	.06
Spanish	2.40	3.81*				
Negative Emotion						
German	3.80	6.02**	2.10	3.24*	.01	.02
French	2.80	3.98*	1.91	2.65*	.24	.33
Russian	5.67	8.08**	3.45	4.44*	0.09	0.12
Spanish	4.04	6.40**				

Note. For each dictionary, two t-tests compared the transformed data for the control group forums (dictionary % prevalence) to depression and suicidal ideation forum groups. One t-tests also compared the depression forums group with suicidal ideation forums group. There were no suicidal ideation forums in Spanish. 'I' = First person singular pronouns (e.g. *I, me, my*). *$p < .05$. **$p < .001$

3.4.3 Analysis of Covariance.

We ran an analysis of covariance (ANCOVA) to measure the unique predictive validity of absolutist words after partialling out the effects of the negative emotion words and pronouns. We found that there was a significant main effect for the absolutist index between groups, after controlling for negative emotions words and pronoun's, for the German forums $F(2, 1032) = 39.989$, $p < .001$), French forums $F(2, 885) = 3.548$, $p < .029$) Russian forums $F(2, 778) = 9.558$, $p < .001$) and Spanish forums $F(1, 828) = 34.802$, $p < .001$). Paired comparisons reveal that all contrasts that were significant, remained significant to $p < .05$.

3.5 Discussion

Across a range of languages, we find that absolutist words are strong markers for depression and suicidal ideation natural language. Specifically, we found a significantly greater percentage prevalence of absolutist words in German, French, Russian and Spanish depression/suicidal ideation forums compared to control forums. This replicates and extends previously reported findings using English language forums (Al-Mosaiwi and Johnstone, 2018). We can therefore infer, that the phenomenon is not specific to any given culture or language.

For the languages included in this study, we found no significant differences in the prevalence of absolutist words between depression and suicidal ideation forums. This conflicts with Al-Mosaiwi and Johnstone (2018) where suicidal ideation forums were shown to contain significantly more absolutist words than depression forums for English language forums. It should be noted that in conducting the data collection, we struggled to find adequate suicidal ideation forums in other languages. We failed to

find any in Spanish, and only one for each of the remaining languages. By contrast, in Al-Mosaiwi and Johnstone (2018) we had collected data from four separate suicidal ideation English language forums (more than all the languages in this study combined). This may also explain why the difference between control and suicidal ideation French forums did not reach significance. It could be therefore that with more data, a better estimate of absolutist words in suidial ideation forums would have generated more significant differences. Moreover, members self-select into forums and it may be that English language suicidal ideation forms are more clearly district from depression forums, as compared to forums included in this study. Once again, with so few suicidal ideation forums included in the study, it is difficult or make clear inferences.

There is an important distinction between function words (e.g. articles, prepositions) and content words (e.g. nouns, adjectives). Function words shape the structure of language and determine grammatical relationships, but have little lexical meaning. Content words name objects and their qualities, they have lexical meaning, but do not play a grammatical or structural role. Absolutist words and pronouns are function words, while negative emotion words are categorized as content words. Put more simply, absolutist words and pronouns relate to *how* people think, negative emotion words relate to *what* people think.

Of the function words, pronouns are considered to be the best markers for depression and suicidal ideation natural language (Tausczik and Pennebaker, 2010). We have shown previously (Al-Mosaiwi and Johnstone, 2018) that absolutist words are actually better linguistic markers (produce larger effects and more significant results) than pronouns. In this study, we have reaffirmed this conclusion, by

replicating and extending this finding using four other languages. With respect to *how* people think, we conclude that absolutist words are the strongest markers for depression and suicidal ideation, in every language tested. Negative emotion words did produce larger average effects than absolutist words, however as discussed, these are content words. It is less meaningful to compare content words with function words as they address separate aspects of language.

Chapter 4: Absolutist words in a clinical and community sample

4.1 Introduction

Having tested our method of estimating the prevalence of absolutist words usage in the natural language found on internet forums. We aimed toextend this word by examining the prevalence of absolutist words in data collected from a community and clinical sample. We obtained our data through a collaboration with the 'Anxiety and Depression in Young People (AnDy) Research Clinic'. The AnDy clinic had data from a research project which recruited 206 participants (aged 12-18) in a community sample. The sample included young people with symptoms of depression and anxiety similar to those in a clinical population (81 participants had anxiety symptoms similar to those with clinically diagnosed anxiety disorder and 45 participants had depression symptoms similar to those with clinically diagnosed depressive disorder). However, the AnDy clinic make clear that the presence of clinical depression and/or anxiety diagnoses was not formally assessed, therefore the fraction of the sample that might have met formal diagnostic criteria is undetermined.

We predicted that participants with symptoms of anxiety and depression similar to that of a clinical population would use more absolutist words than participants with symptoms of anxiety and depression similar to that of a community sample. This expectation is driven by our findings in chapter 2 and 3, as well as the clinical literature which identifies absolutist thinking as a cognitive distortion and vulnerability factor for affective disorder.

4.2 Method

Participants were administered a modified version of the 'Ambiguous Scenarios Test for Depression' (AST-D; Berna et al., 2011). Some items were removed as they were not deemed pertinent to adolescents, others were modified to make them more pertinent for adolescents, the final form of the AST contained 20 items. For each of the 20 items, participants were asked to (a) rate the scenario for pleasantness (from 1 = Not at all pleasant; to 9 = Very pleasant) and (b) give a written description of their imagined outcome for the situation. Participants completed the measure without time restrictions.

In our study, we collected all the written responses for each item on the measure. These were transcribed onto a word processor and compiled into a single text document. The response from participants that had anxiety and depression symptoms similar to a clinical population were separated from the rest of the community sample. Therefore, we generated two text documents for each item (community and clinical sample), and there were 20 items in total.

4.3 Results

An independent samples t-test was conducted to compare the percentage prevalence of absolutist words in the answers of clinical and community samples. We found that there was no significant difference in the percentage prevalence of absolutist words between the answers of clinical (M = .815, SD = .675) and community (M = .831, SD = .607) samples; t(38) = -.079, p = .938.

We also found, that for the percentage prevalence of pronouns, there was also no significant difference between the answers of clinical (M = 19.569, SD = 4.814) and community samples (M = 19.427, SD = 4.321); t(38) = .099, p = .922.

There was however a significant difference in the percentage prevalence of negative emotion words between the answers of clinical (M = 5.643, SD = 2.422) and community (M = 3.984, SD = 1.896) samples; t(38) = 2.411, p = .021.

4.4 Discussion

We have not replicated our findings in chapter 2 and 3 using the answers to questions collected in-lab. When answers are not in the form of natural language, but rather constrained by having to address a specific question, the effects previously shown are not apparent. This also applied to pronouns, another linguistic marker strongly identified with the natural language of depressed and anxious individuals.

Chapter 5: Linguistic Markers of Moderate and Absolute Natural Language

5.1 Chapter overview

As discussed at the end of chapter 2, measuring absolutist thinking has previously relied on totalling the number of absolute responses on Likert scales. In chapter 2 we introduce a natural language text analysis alternative to this method with a number of distinct advantages. In this chapter, we will discuss these advantages and identify natural language markers for absolute responding on Likert scales. In this way, the two methods will be compared directly and we can observe where they overlap.

In social, personality and mental health research, a stylistic tendency for selecting extreme end-points on Likert scales (absolute responding) has been linked to certain cultures, lower intelligence, lower income and personality/mental disorders. In this study, we introduce a more sophisticated, informative and ecologically valid approach for estimating absolute responding. We identified natural language markers that correspond to absolute responding on Likert scales. We focussed on 'function words' (e.g. particles, conjunctions, prepositions) as they are more generalizable because they do not depend on any specific context.

We conducted a text analysis of online reviews for films, tourist attractions and consumer products. All written reviews were accompanied by a rating scale (akin to Likert scale), which allowed us to label text samples as absolute/moderate (study 1), and positive/negative (study 2). Study 1 identified 18 function words that could classify absolute/moderate text with over 90% accuracy. Dictionaries from the

Linguistic-Inquiry and Word Count software (Pennebaker, Booth, Boyd, & Francis, 2015), revealed that thoughtfulness was more prevalent in moderate text, while certainty was more prevalent in absolutist text. Importantly, we also found that our 19 words absolutist dictionary also correlated strongly with absolute reposes on Likert scales. This confirms the convergent validity between calculating the percentage prevalence of absolutist words in natural language and absolute responding on Likert type scales. In study 2, text analysis found that negativity was associated with differentiation, deficit and the past; whereas positivity was associated with inclusion and the present.

Having established convergent validity, in study 3, we apply our more sophisticated and ecologically valid method of measuring absolutist thinking to determining whether there are differences in absolutism between cultures. Past research has controversially suggested that African American and Latin American cultures are more prone to absolute responding, relative to White American and Asian American cultures. These findings were predicated on Likert-type responses; study 3 finds they generally cannot be supported when measured in a more ecologically valid method and in natural language.

5.2 Introduction

In social, personality and mental health research, absolute responding (or 'extreme' responding) is a response style estimated using Likert type scales. Where selecting the absolute endpoints of a scale (e.g. 1 and 5 on a 5-point scale) corresponds to absolute responding, while selecting any point in-between corresponds to non-absolute or moderate responding. This study aimed to identify linguistic markers

which act as surrogates to absolute and moderate responding on Likert scales. These markers could expand our understanding of both the language and cognition related to absolute and moderate responding. The language we use has previously been shown to relate to the way we think (e.g., Al-Mosaiwi & Johnstone, 2018). In measuring absolute and moderate responding, linguistic markers are also a more informative and ecologically valid alternative/addition to using Likert scales.

5.2.1. Absolute Responding using Likert Scales and the Limitations

Absolute responding on Likert-scales has been linked to a number of cognitive, social and cultural factors. Lower IQ and less education (e.g., Light, Zax & Gardiner, 1965; Marin, Gamba & Marin, 1992) have been associated with more absolute responding, as have personality characteristics such as intolerance of ambiguity and simplistic thinking (e.g., Naemi, Beal & Payne, 2009).

Greater absolute responding has also been linked to 'black' and 'Hispanic' cultures (e.g., Bachman & O'malley, 2010; Hui & Triandis, 1989; Marin, Gamba & Marin, 1992); while lower absolute responding (more moderate responding) is linked to Japanese, Chinese (e.g., Chen, Lee, & Stevenson, 1995) and Korean cultures (e.g., Chun, Campbell & Yoo, 1974). On closer inspection, these cultural findings often depend on the size of the scale used; an observed effect on a 5-point scale may not be apparent on a 10-point scale (e.g., Clarke, 2000; Hui & Triandis, 1989). Such inconsistencies naturally raise doubts about the veracity of the results.

Additionally, a series of studies with depressed participants reveal that both positive and negative absolute responses on Likert scales predicted future relapse (e.g., de Graaf et al., 2010; Peterson et al., 2007, Teasdale et al., 2001). However,

other studies have failed to find the effect (Ching & Dobson, 2010), or raised methodological concerns regarding the use of Likert scales, specifically in reference to the effect of item content on response style (Forand & DeRubeis, 2014). That is, the content of the questions and the labelling of the end-points (e.g. “Mostly agree”), could compromise the absolute nature of an end-point response. This moderating effect would not be accounted for when simply measuring the number of end-point responses.

These previous findings have exclusively relied on observing an absolute response style on Likert scales. This simplistic method cannot be applied to qualitative data, it lacks ecological validity, and there is no evidence as to whether the findings generalize beyond Likert scales. That is, it is not clear whether the absolute responding of some groups relates to meaningful differences in absolutist thinking, or simply an experimental artefact specific to using Likert scales.

Our proposed method of measuring absolute responding through linguistic markers in natural language presents an alternative that avoids some of the limitations inherent to Likert scales. Being based on complex, naturalistic data (natural language), it offers greater flexibility and ecological validity because it is not reliant on structured response formats and can be used in an observational study of data acquired from a wide variety of sources.

5.2.2. Function Word Linguistic Markers

To be generalizable, linguistic markers cannot depend on the content of any given subject (e.g. nouns, verbs, adjectives), as these will differ from one subject to another. Therefore, we restrict our feature selection to include only ‘function words’, which

have a grammatical and structural role, but convey little to no content (e.g. particles, conjunctions, prepositions). Ordinarily, we attend to the content of language and have little conscious awareness of its functional style. For this reason, function words have previously been examined as implicit measures, particularly for differences in writing style (for review see Tausczik & Pennebaker, 2010).

Text analysis studies have associated specific classes of function words with certain writing styles. For example, conjunctions, negations, articles and prepositions have been associated with a categorical or formal language style (Chung & Pennebaker, 2007). Exclusive words (e.g. “but”, “except”, “without”), conjunctions and prepositions have been shown to be markers of greater ‘cognitive complexity’ (Pennebaker & King 1999). Increased use of auxiliary verbs, pronouns and adverbs are characteristic of a narrative language style (Pennebaker et al., 2014). Personal pronouns predictably indicate a self-focus; while it is suggested that third person pronouns (they, he, she) are a sign of wellbeing (Chung & Pennebaker, 2007). We aim to extend this literature by identifying function words which correlate with absolute and moderate responding on Likert-type scales.

5.2.3. Machine learning classification

Text analysis combined with machine learning has regularly been used to classify natural language text linked to positive vs. negative ratings (e.g., Feldman, 2013); this is referred to as ‘sentiment analysis’. In this study, we followed the same process, except we were interested in absolute/moderate ratings differences, rather than positive/negative. The purpose of building a classifier, similar to those previously used

for valence classification, was to demonstrate the predictive accuracy of the linguistic markers we identified in the training set.

Although we were primarily concerned with identifying functional linguistic markers for absolute and moderate ratings. In a second study, we also took the opportunity to identify functional word markers for positive and negative sentiment. This is a novel approach, as most valence sentiment analyses exclude function words because they have little semantic meaning. To the best of our knowledge, no study has previously conducted a sentiment analysis using only function words.

5.3 Methods and Data Analysis

5.3.1. Data Collection

The internet is increasingly being used as a source of naturalistic writing for research in linguistics and psychology. Many websites allow users to leave lengthy comments in the form of personal narratives, requests for help, or reviews. In this study, we collected natural language text posts from three popular websites; IMDB, TripAdvisor and Amazon. All three websites combine a star rating system (akin to a Likert scale) with written natural language reviews about films, holiday destinations or products respectively. Reviews paired with the lowest or highest (end-point) ratings were labelled absolute, and all other reviews were labelled non-absolute (or moderate). The valence of the reviews (positive or negative) was not factored into the analysis. This means that absolutely positive reviews were grouped with absolutely negative reviews as they were both absolute. Convergent validity in absolute responding between Likert scales and natural language was therefore estimated using the star rating scales and the text posts of these websites.

We selected the websites IMDB, TripAdvisor and Amazon as they were large enough to provide sufficient data for training and testing with our classifier approach. All three websites currently have the most web traffic in their respective domains of 'Arts and Entertainment', 'Travel' and 'Shopping' as shown by *www.similarweb.com*. We selected websites from three completely different industries, so that the linguistic markers identified would be less dependent on any particular context. In IMDB, users commented on films, for TripAdvisor they wrote about tourist destinations and on Amazon they reviewed everyday products. From each website we selected 18 films, tourist attractions and products, respectively. Generally, our selection procedure was to first identify the films, tourist attractions and products with the most overall number of reviews. We then singled out those that had the broadest ratings distributions (i.e. not predominantly positive or negative). This was to ensure a reasonable sample size could be collected at each level of the star rating scale. Additionally, we were keen to select films, tourist attractions and products from wide mix of different genres, countries and categories (respectively).

For each film, tourist attraction and product, we gathered the written text accompanying each star rating. We aimed to collect 15,000 words for each level of star rating for all films, attractions and products. Where this was not possible, we simply collected all the available reviews, ensuring a minimum of 3,000 words were sampled. These were copied and pasted into a single text file. For TripAdvisor and Amazon, reviews are rated on a 5-point scale, this resulted in 90 text files (18*5) from each website. IMDB was a slight exception, where the star rating scale ranges from 1-10 (not 1-5), so we generated 180 text files (18*10) for this website.

To reduce the IMDB 10-point scale to match with the Amazon and TripAdvisor 5-point scales, we first aligned the absolute end-points. For both scales, 1-star meant absolute negative. Absolute positive is 10-stars for IMDB but was reassigned to 5 to match the TripAdvisor and Amazon 5-point scale (i.e. 1-star -> 1-star; 10-stars -> 5-stars). We next determined that the central values on the 10-point scale (that corresponding to '3' on a 5-point scale) were between 5-6, these were reassigned as 3 (i.e. 5-stars -> 3-stars; 6-stars -> 3-stars). This meant that 2-4 stars on a 10-point scale, which are neither absolutely negative, nor central, corresponded to 2-stars on a 5-point scale. Similarly, ratings 7-9 stars on a 10-point scale, which are neither absolutely positive, nor central, corresponded to 4-stars on a 5-point scale. This realignment achieved our main objective of preserving the integrity of the absolute end-points (e.g. not combining 9-stars with 10-stars, as 9-stars is not an absolute).

5.3.2. Data-Analysis in R

We used R programming language (R Development Core Team, 2010) to conduct the text analysis and measure function word usage by dividing text into unigrams (single words). For our training set, we identified unigrams which best differentiated between absolute and moderate natural language. These would then be used in machine learning classification, on an independent test set, to automatically label text as either absolute or moderate.

5.3.2.1. Pre-processing Data

Text analysis and pre-processing was performed using the quanteda Package (Benoit et al., 2016) in R. We first divided our data into a training and test set (70:30 split), we

used a stratified partition to ensure that the proportions of the different groups (i.e. absolute/moderate; positive/negative) were comparable in both the training and test sets. Both sets were then tokenized (separated into individual words), and all tokens (words) were converted to lower case.

In R, function words are termed 'stop words', as these are traditionally the words which data scientists remove from their analysis. Stop words are commonly viewed as unimportant because they convey little content, therefore R has standard procedures for removing them. By making slight alterations to these same procedures, we could retain stop words and remove all other words (content words) instead.

Tokens were then 'stemmed', this is a process which reduces words to their root form, for example, the words 'argued', 'argues' and 'arguing' would become 'argue'. Tokens were also normalized by converting frequency counts for each token type into percentage prevalence values. Importantly, the features on the test and training data sets must match; therefore, tokens which only appear in the test set were removed and tokens which only appear in the training set were added to the test set with a percentage prevalence score of 0.

5.3.2.2. Feature Selection and Classification

Machine learning and classification was implemented with the caret package (Kuhn, 2008) in R. Other functions, including data manipulation and visualization tools were retrieved from the CRAN library (R Core Team, 2014).

A Gaussian naive Bayes classifier was used to classify absolute and moderate labelled reviews (Appendix 11-12). Naive Bayes is a probabilistic classifier based on

applying Bayes' theorem and assumes independence between features. This classifier was used because it is simple, predicts between categories, and is particularly suited when the dimensionality of inputs is high, as is the case with text analysis (Scikit-learn, 2016).

Each function word token was treated as an independent predictor, and its importance was evaluated individually. Receiver operating characteristic (ROC) curve analysis was conducted on each predictor, plotting their true positive rate against the false positive rate for a range of discrimination thresholds. The area under the curve (AUC) of the ROC was used as the metric for variable importance. Function words were then ranked according to their importance and sequentially incorporated into the classifier to determine how many of these linguistic markers are required to satisfactorily discriminate between absolute and moderate natural language. This is done via cross-validation, a process that partitions data into 'training' and 'test' sets. The training set was used to identify the most important features, and to train the naive Bayes classifier. The 'test' set is used only to examine the predictive accuracy of the trained classifier. More important than the classification accuracy is the Cohens Kappa statistic, which compares the observed accuracy with the expected accuracy (random chance), thereby taking into account prior probabilities. Generally, a kappa greater than 0.75 is considered 'excellent' (Fleiss, 1981). We thus obtain classification accuracies for models with increasing numbers of features.

5.3.2.3. Feature Selection and Classification of Valence

Our main objective was to examine content-free function words as markers for the style of responses (absolute/moderate). For the purpose of comparison, we

conducted an additional feature selection and classification analysis of the valence content of responses (positive/negative) using the same data and methodology. Reviews paired with 1-2 stars were labelled negative, and reviews with 4-5 stars were labelled positive.

5.4 Results

5.4.1 Unigrams and classification

Based on ROC curves, we identified tokens (unigrams) which were most predictive of moderate and absolute reviews (Figure 5.1). The Kappa values for trained models with increasing numbers of linguistics features are shown in Figure 5.2. Interestingly, the top three features alone (the words “but”, “seem” and exclamation marks) can be used to adequately distinguish absolute and moderate natural language in the test set (kappa = 0.73). The best classification accuracy is achieved by including the top 25-34 features (kappa = 0.76-0.80). There is then a precipitous drop in classifier performance when more than 34 features are added to the model, this is referred to as ‘over-fitting’, and occurs when new features add more noise than signal.

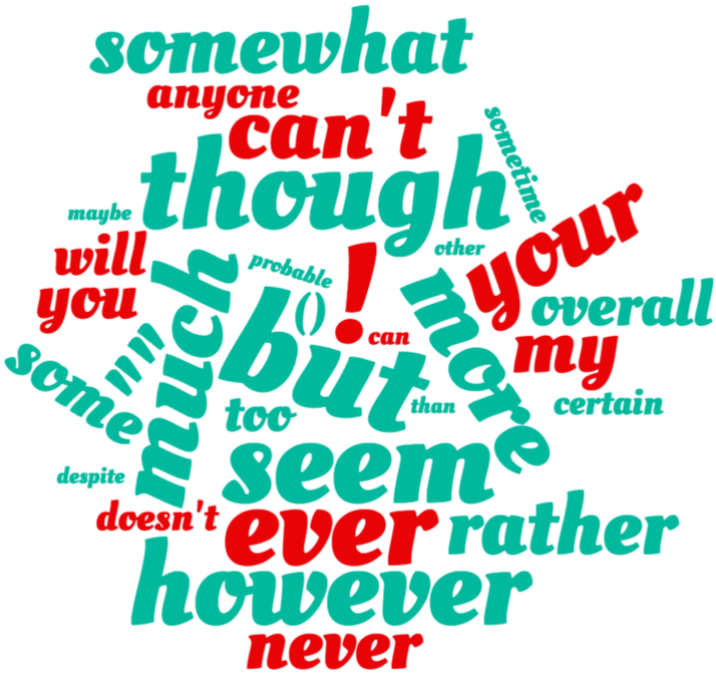

Figure 5.1 The top 31 tokens (unigrams) which are most predictive of absolute and moderate reviews. The size of font reflects the order of importance as designated by the ROC curve values for each unigram. The tokens specific to absolute reviews are in red, while the tokens specific to moderate reviews are in green.

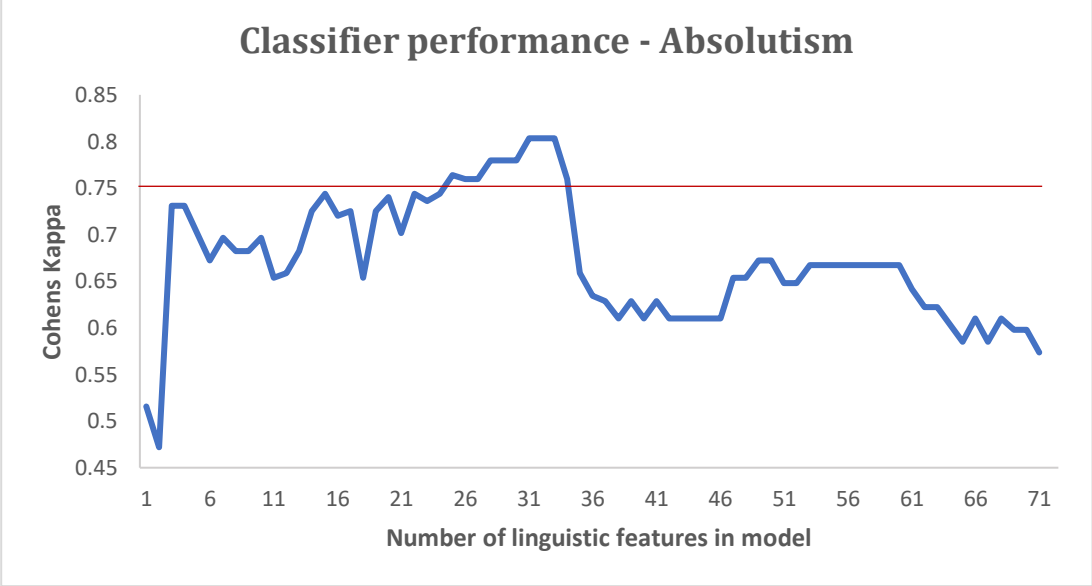

Figure 5.2 Cohens Kappa accuracy values for classifiers with increasing features as ranked by the receiver operating characteristic curve analysis.

5.4.2 Unigram natural language markers - absolutism

The highest kappa was obtained using the top 31 linguistic features (Figure 5.2), of these, 11 are specific to absolute reviews and 20 are specific to moderate reviews (Figure 5.1). We combined the absolute words into a single dictionary to analyse their distribution across the 5-point rating scale. This was done using the Linguistic Inquiry and Word Count software (LIWC; Pennebaker, Booth, Boyd, & Francis, 2015), which calculates the percentage prevalence of words. To analyze the data, a linear mixed-effects modeling approach was adopted (see Appendix 1 for the SPSS syntax script). This is the recommended analysis method for this type of data structure (Baayen, Davidson, & Bates, 2008). Our fixed factor is the star ratings and our random factor is the websites. Mixed-effects models consider both fixed and random effects and can be used to assess the influence of the fixed effects on the dependent variable after accounting for random effects (namely, correlated residuals in star ratings from the same website). We found a significant main effect for the absolutist words with respect to the star rating factor $F(4, 327) = 40.01$, $p < .001$. There was also a significant main effect for websites $F(2, 327) = 216.97$, $p < .001$, but no significant interaction between star ratings and websites $F(8, 327) = 1.12$, $p = .35$. Paired comparisons with a Bonferroni correction for star ratings found that 1-star reviews (M = 2.07%, SD = .60) had significantly more absolutist words than 2 (M = 1.39%, SD = .52, $p < .001$), 3 (M = 1.46%, SD = .52, $p < .001$) and 4 (M = 1.30%, SD = .54, $p < .001$) star reviews; but crucially were not significantly different from 5-star reviews (M = 2.12%, SD = .71, $p = .74$). Similarly, 5-star reviews also had significantly more absolutist words than 2 ($p < .001$), 3 ($p < .001$) and 4 ($p < .001$) star reviews. There was no significant difference in the prevalence of classifier absolutist words between 2, 3 and 4-star

reviews (p's > .46; Figure 5.3). Paired comparisons for the random factor of website found that the prevalence of classifier absolute words was significantly different between all three websites (p's < .001). However, there was no interaction between websites and star ratings (Figure 5.3).

5.4.3 Unigram natural language markers - moderation

We combined the 20 remaining classifier moderate words into a single dictionary to analyse their distribution across the 5-point rating scale using the LIWC. We ran a linear mixed effects model, with star ratings as the fixed factor and websites as a random factor. We found a significant main effect for the classifier moderate words with respect to the star rating factor $F(4, 327) = 36.47$, $p < .001$). There was also a significant main effect for websites $F(1, 327) = 33.07$, $p < .001$, and no significant interaction between ratings and websites $F(8, 327) = 1.18$, $p = .31$. Paired comparisons for star ratings found that 1-star reviews (M = 4.19%, SD = .52, $p < .001$) had significantly fewer moderate words than 2 (M = 4.97%, SD = .58, $p < .001$), 3 (M = 5.15%, SD = .59, $p < .001$) and 4 (M = 5.19%, SD = .65, $p < .001$) star reviews; but crucially, were not significantly different from 5-star reviews (M = 4.36%, SD = .56, $p = .91$. Similarly, 5-star reviews also had significantly fewer moderate words than 2 ($p < .001$), 3 ($p < .001$) and 4 ($p < .001$) star reviews (Figure 5.3). Paired comparisons for the random factor of website found that the prevalence of classifier absolute words was significantly different between all three websites (p's < .001). However, there was no interaction between websites and star ratings (Figure 5.3).

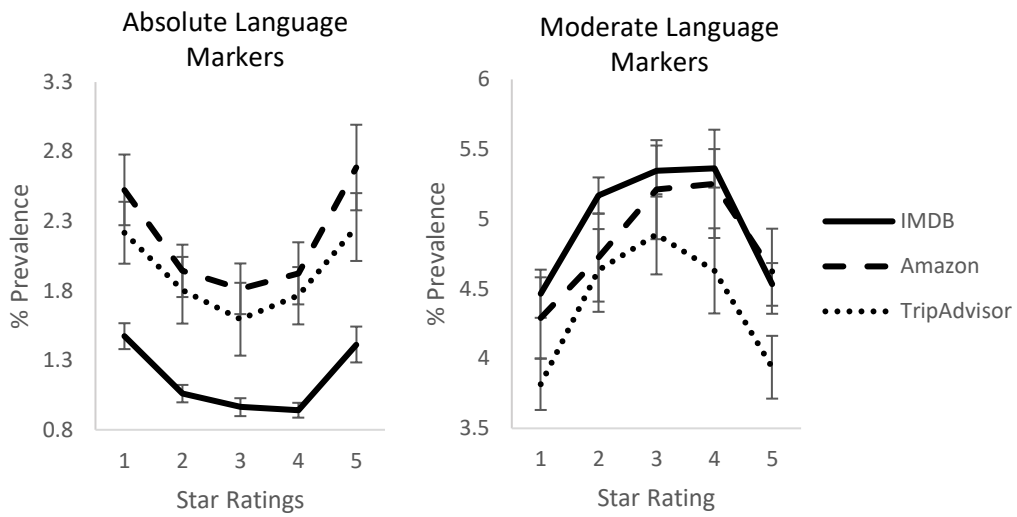

Figure 5.3 Prevalence of absolute and moderate words, across different star ratings for IMDB, Amazon and TripAdvisor websites. Error bars represent 95% confidence intervals.

5.4.4 Unigrams and Classification of Valence

Based on ROC curves, we identified tokens (unigrams) which were most predictive of positive and negative reviews (Figure 5.4). The Kappa values for trained models with increasing numbers of linguistics features are shown in Figure 5.5. Overall, the classification accuracies for valence are lower than those for absolute and moderate ratings. None of the models achieved a kappa value of 0.75, the standard for excellent classifiers set by Fleiss (1981). This reveals that function words are better markers for the style of responses (absolute/moderate) than for the content of responses (positive/negative).

Figure 5.4 The top 30 tokens (unigrams) which are most predictive of positive and negative reviews. The size of font reflects the order of importance as designated by the ROC curve values for each unigram. The tokens specific to positive reviews are in orange, while the tokens specific to negative reviews are in blue.

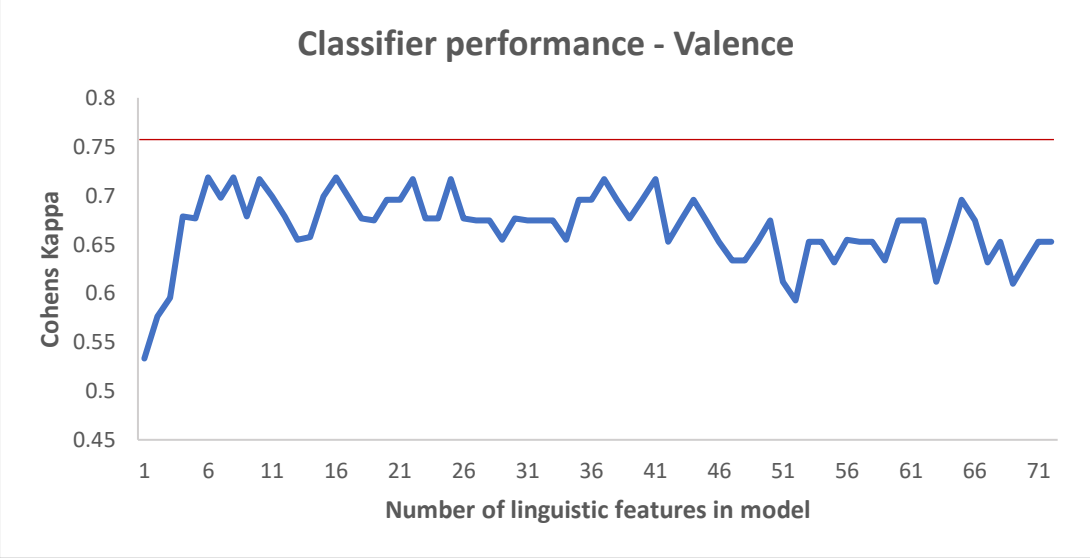

Figure 5.5 Cohens Kappa accuracy values for classifiers with increasing features as ranked by the receiver operating characteristic curve analysis.

5.5 Discussion

5.5.1. Unigrams and Machine Learning

Our feature selection process identified 31 unigrams which most distinguish absolute natural language from moderate natural language in review comments. Of these, 11 were specifically more prevalent in absolute review comments and 20 were specifically more prevalent in moderate review comments. The classifier's absolutist words include 'ever', 'never' and 'anyone', which are defined as 'at any time', 'at no time' and 'any person', respectively, therefore all denoting absolutes. Also included are the determiners 'my', 'you' and 'your', which determine the reference for a noun group. There are two negations "can't" and "doesn't", which are used in categorical imperatives. The final linguistic feature is 'exclamation marks', which are used as intensifiers.

For the moderate words included in the classifier, 'but', 'though', 'despite', 'other' and 'however' are all used to introduce nuance or exception. The words 'much' and 'more' both refer to large amounts. The words 'rather', 'somewhat' 'sometime' and 'some' all specify a moderate extent or amount. The moderate words 'seem' 'maybe' and 'probable' have a vague noncommittal property and the word 'overall' seeks to combine separate components. Finally, it was surprising to find that the word 'certain' is specific to moderate reviews as certainty is absolutist. Analysis of 'certain' used in context reveals that it is used to specify subcomponents (e.g. "certain aspects") rather than relating a state of total confidence (e.g. being certain).

Throughout, we have used the term absolute rather than 'extreme' as we believe, and have previously demonstrated (Al-Mosaiwi & Johnstone, 2018) that there is a qualitative difference between words that convey absolutes and words that

convey large extents (or extremes). This can also be gleaned here, where the words 'much' and 'more', which denote large amounts, are actually markers specific to moderation as opposed to absolutism.

Using these 31 predictors, our classifier test performance accuracy is greater than 90% with a Kappa greater than 0.80. This is considered excellent by prominent guidelines for classifier accuracy (e.g., Fleiss, 1981). Interestingly, good classifier performance was achieved using any number of features from the top 3-35, as defined by Fleiss (1981). There is therefore flexibility for researchers in selecting linguistic features that measure absolute/moderate natural language in text.

In this study, we have restricted our feature selection to stop words/function words, unlike the majority of other text analysis classifiers. We believe this will improve the generalizability of our classifier as it is not dependent on subject specific content or sentiment analysis.

For both absolutist and moderate words, we found an effect of website (random factor) but no interaction between websites and the star ratings. This means that although the percentage frequency of these words varied between different contexts (i.e. films, tourist attractions and products), the relative distribution across the rating scales remains the same. The similar distribution pattern of predictors across the rating scales, for all the websites, affirms our intention to identify generalizable linguistic markers for absolute and moderate text. Moreover, we found there was no significant difference in percentage prevalence for absolute words and moderate words between absolute positive (5-stars) and absolute negative (1-star) natural language reviews. Our predictors are therefore independent of valence. This is a necessary quality for generalizable absolute/moderate natural language markers.

Finally, we found that the percentage prevalence of absolute words was only significantly elevated at absolute end-point reviews and that there was no significant difference between moderate 2-4 star ratings. This was not the case for moderate words, which were not as discriminating.

As detailed in the introduction, there are practical applications for these linguistic markers of absolute and moderate responding. They could be employed by researchers to estimate absolute and moderate language in qualitative natural language data. This could be done for various groups of interest, possibly in an observational study design. Such an analysis would be more informative than counting absolute responses on Likert scales, and significantly more ecologically valid. In this way, previous findings relating to absolute and moderate response style, which have relied exclusively on Likert scales, could be supported or challenged via a linguistic analysis. This is especially important as many of these findings are contentious and consequential.

5.5.2 Limitations and Future Directions

In this study, we used review websites as they conveniently provide both natural language and a Likert type rating scale, which allows us to establish convergent validity. However, more work is needed to confirm or amend the features identified in this study based on a wider variety of writing topics and formats (e.g. narrative writing). We employed a simple naive Bayes classifier because it is easy to train and produces excellent results, however, more sophisticated algorithms would no doubt further improve the classification accuracy. Although, sophisticated classification models can be difficult to interpret and suffer from over fitting. Also, in this study we

made no distinction between extreme and moderate ratings in the classification problem. Future work may seek to classify absolute vs. extreme natural language. Finally, just as there are possibly cultural differences in response styles on Likert scales, this may also be the case for absolute and moderate language use. While the use of absolutist words have previously been shown to reflect absolutist thinking (Al-Mosaiwi & Johnstone, 2018), whether this is impacted by cultural differences is not clear.

5.5.3 Author Contributions

M. Al-Mosaiwi created the research design, collected, analyzed, and interpreted the data under the supervision of T. Johnstone. M. Al-Mosaiwi drafted the manuscript, and T. Johnstone provided critical revisions.

Chapter 6: The Prevalence of Absolutist Words Between Cultures

6.1 Introduction

An extreme response style is the tendency to select the extreme end-points on Likert scales. While in the literature it is commonly termed extreme responding, here we will use the term absolute, as it is more accurate. It is believed that certain cultures/ethnicities are more prone to absolutist responding, and correspondingly there are cultures/ethnicities believed to be less prone. A series of studies have found that black Americans are more prone to absolute responding on Likert scales than white Americans (Bachman and O'Malley, 1984; Bachman et al., 2010; Bachman et al., 2011). Additionally, several studies have also shown that Latin American/Mexican cultures were also more prone to an absolutist response style compares to white Americans (Davis, Resnicow and Couper, 2011; Rao, 2009; Weech-Maldonado, 2008). In contrast, studies have found that Asian Americans/Japanese Americans are less disposed to an absolutist response style (Liu, Conrad and Lee, 2017; Johnson, 2005; Zax and Takahashi, 1967; Hamamura, 2008)

An implicit suggestion in this research is that the response style differences signal differences in thinking. However, we believe that measuring absolute responding/thinking on Likert scales lack ecological validity. A more sophisticated method has already been described in chapter 2, therefore in this study we aim to determine whether the findings described can be replicated though a text analysis of the natural language of these groups. We will run our absolutist dictionary from

chapter 2, and the classifier absolute and moderate words dictionaries from chapter 2. To replicate previous findings in the literature, with this new more sophisticated method, we would expect to see a higher prevalence of absolutist words in the natural language of black and Latin American cultures compared to white Americans. Moreover, we would also expect to see lower levels of absolutist words in Asian American natural language compared to all the other groups. Correspondingly, we would expect to see this pattern in reverse for the moderate words identified in chapter 2.

6.2 Methods

6.2.1 Data collection and processing

In this study, we set out to collect the natural language text data in 200 different blogs, authored by individuals belonging to one of three ethnicity/culture groups (White, Black, Asian American, Latin American), this meant collecting 50 blogs for each group. The blogs in each group covered a wide range of different topics including entertainment, culture, news, beauty, family, fashion, food, health, patenting, politics, relationships, travel, lifestyle, parenting and technology. We aimed to have each topic covered in all the groups, with approximately equal proportions. Blogs were located through a Google search for blogger in each culture group (e.g. “black bloggers”). This often found websites that had listed such bloggers, we systematically went through such lists as we could find to locate suitable bloggers. A blog was included if it supplied a minimum of 200 words of natural language, covered on of the topics listed above, was authored by a representative member of that groups culture/ethnicity and was a blog rather than a more officious and profession news outlet. The

culture/ethnicity of the authors was determined by visually inspecting their picture on the blog, in the rare cases where a picture was not apparent, we looked for other signs, such as explicit mentions (e.g. *"as a black x…"*). Once an appropriate blog was located, we copied the natural language text and pated it into a text document ready for subsequent analysis, this was done 50 times for each group. The text documents underwent word counting analysis using the Linguistic inquiry and word count software (LIWC). We ran our absolutist dictionary, which was constructed in chapter 2, as well as the classified absolutist dictionary and classifier moderate dictionary described in chapter 2.

6.3 Results

With respect to the percentage prevalence of absolutist words, there was no statistical difference between groups as determined by a one-way ANOVA ($F(3,196) = 1.381$, $p = .25$). This is confirmed by paired comparisons which found no significant difference between any of the groups (Figure 6.1; p's > .464).

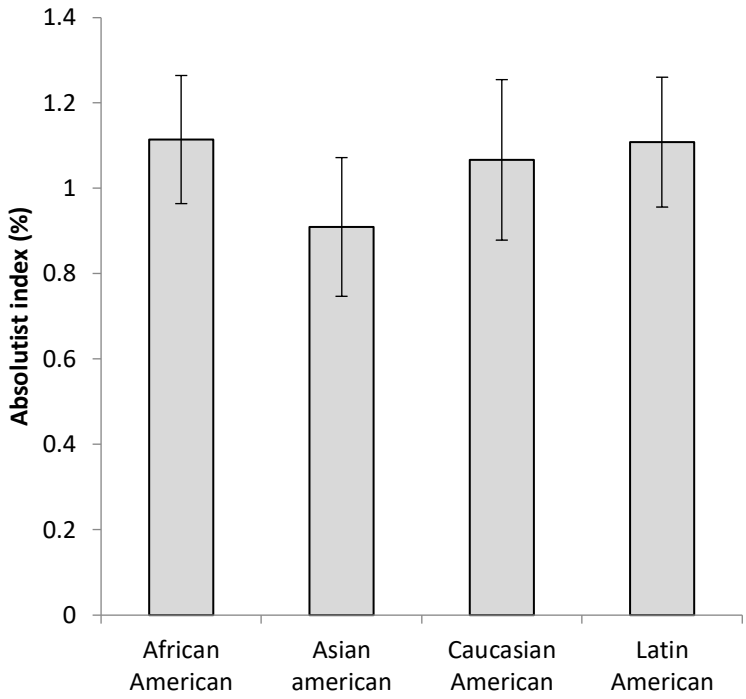

Figure 6.1 Mean percentage of absolutist words in blog posts for different cultural groups. Error bars indicate ± 95% confidence intervals.

Similarly, for the percentage prevalence of classifier absolutist words, there was no statistical difference between groups as determined by a one-way ANOVA ($F(3,196) = 1.631$, $p = .183$). This is confirmed by paired comparisons which found no significant difference between any of the groups (Figure 6.2; p's > .188). For the percentage prevalence of classifier moderate words, there was a statistical difference between groups as determined by a one-way ANOVA ($F(3,196) = 3.748$, $p = .0.12$). Paired comparisons found that Latin American blogs used significantly fewer moderate words (M = 1.36%, SD = .56) than 'White' blogs (M = 1.78%, SD = 0.74; $p = .014$; Figure 6.3)

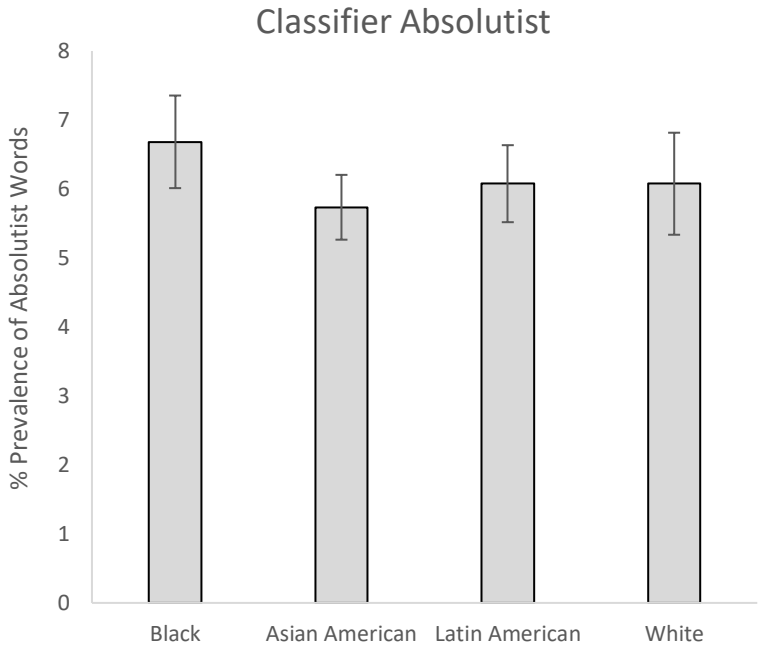

Figure 6.2 Mean percentage of 'classifier' absolutist words in blog posts for different cultural groups. Error bars indicate ± 95% confidence intervals.

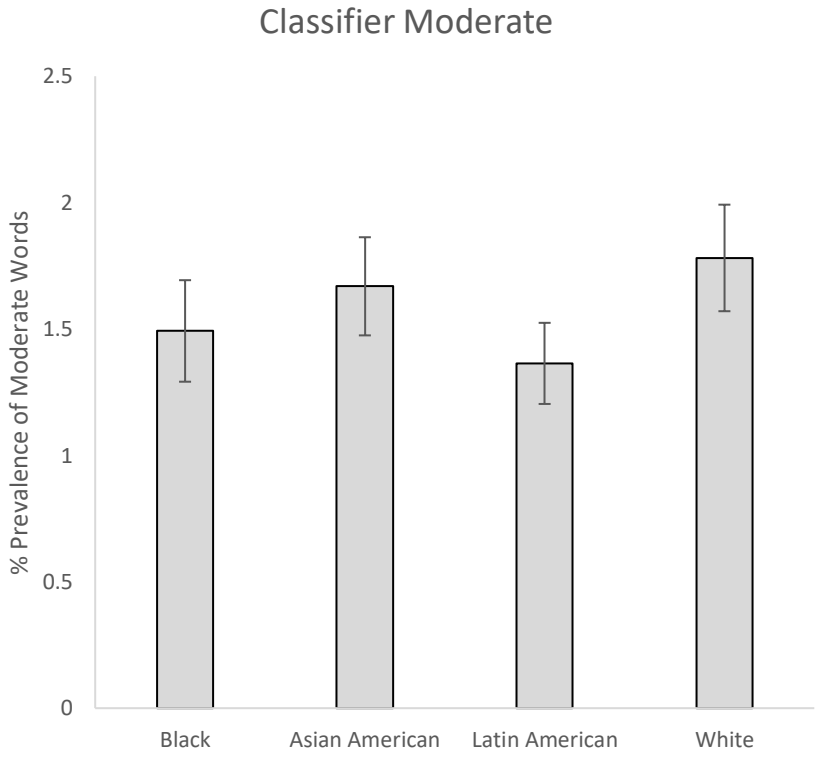

Figure 6.3 Mean percentage of 'classifier' moderate words in blog posts for different cultural groups. Error bars indicate ± 95% confidence intervals.

6.4 Discussion

For the most part, we have not replicated the findings of previous studies, showing a significantly greater tendency for absolute responding in black and Latin American cultures compared to white American culture. Also, we have not found a significantly lower tendency for absolute responding in Asian American culture compared to the other tested cultures. With regard to moderate words, we did find that natural language by Latin American authors did contain fewer moderate words than the natural language authored by white Americans which is consistent with our expectations based on previous research, however no other significant differences were found. Although we found only one difference between the groups which met the significance threshold, the overall pattern of results was consistent with what we expected based on previous literature. Namely, white and Asian American groups used more moderate word and fewer absolutist words. Perhaps with a larger sample, this difference may reach the significance threshold.

Chapter 7: Absolute Positive or Extreme Positive – Which is Preferred?

7.1 Chapter Overview

Thus far, we have examined the relationship between absolutist thinking and various symptoms of affective disorder. We have also assessed and contrasted different methods for measuring absolutist thinking. In this chapter, we will investigate the prevalence of absolutism in community samples. We compare absolute and extreme thinking in a behavioural paradigm, and examine the physiological impact elicited by absolute vs. extreme statements.

We find, that when given the choice, participants strongly prefer extreme (but not absolute) positive statements over those that are absolute. This demonstrates that participants are clearly able to distinguish the two and that they dislike absolutism. The second study employed psychophysiological measures of skin conductance response and heart rate variability. This study found that absolute positive statements elicited significantly lower amplitudes, greater latency and greater dispersion. This suggests that absolute positive statements induced a state of confusion in participants relative to extreme positive statements.

7.2 Introduction

Absolutist thinking, is characterised by a belief which is unqualified by any nuance and independent of context. Extreme thinking, a belief which is extreme (but not absolutist), is the closest thinking style to absolutist thinking. Therefore, for the most

part, the only difference between extreme and absolutist thinking is that extreme thinking is not absolutist. In our first study, we aim to determine the extent to which participants are repelled specifically by absolutism. To do this, we contrast absolutist beliefs with extreme ones, as ask participants to select which the most/least prefer. This is done for both positively and negatively valenced beliefs. We predict that participants will prefer extremely positive statements over absolutely positive ones.

Our beliefs may express absolute probabilities (e.g. absolute certainty) or they mat express absolute magnitudes (e.g. the extent of something is absolute). We set out to discover whether individuals are more likely to endorse absolute probabilities or magnitudes, here we had no specific hypothesis.

Participants selected absolute or extreme beliefs with respect to different scenes. Some of these scenes were social in nature (e.g. party), others were related to achievement (e.g. exam) and the remainder depicted what we term 'core needs' (e.g. doctors office). Core needs relate to the basic necessities of life, such as safety, health and employment. We predicted that participants may be more disposed to being absolutist with respect to core needs, than for social or achievement situations. This is because core needs, as the name suggests, are fundamental requirements and so an absolutist attitude towards them may be more likely.

In our second study, we aimed to determine how absolutist beliefs impact our physiology. We simply recorded skin conductance response and heart rate in participants, while they are presented with absolute and extreme beliefs. Skin conductance in an individual varies depending on the activity of their sweat glands, which are in turn controlled by the sympathetic nervous system. For this reason, it is believed that skin conductance measures psycho-physiological arousal. We expected

that absolute beliefs would result in a higher skin conductance level and possibly a higher frequency of non-specific skin conductance responses. That is, both positive and negative absolute statements will result in greater arousal. This is consistent with theories of fight and flight (an instinct also controlled by the sympathetic nervous system), fight or flight situation induce high arousal and are generally not characterised as nuanced.

7.3 STUDY 1

7.3.1 Method

7.3.1.1 Participants

A total of 46 undergraduate students were recruited from the University of Reading School of Psychology and Clinical Language Studies in exchange for course credit. Participants were predominantly female (88%) with an age range of 18-36 (Mean age = 20 years, SD = 5.84 years). Some level of depression, anxiety or stress was reported by 45.9% of the sample. All participants were recruited through the SONA system, which is an online portal that we used to advertise our study to internal students, manage sign-ups and reward participants with course credits. The study was reviewed by the University Research Ethics Committee and has been given a favorable ethical opinion for conduct. All participants read and signed an information sheet and consent form prior to participation.

7.3.1.2 Materials

Ten different images depicting everyday scenes (e.g. taking an exam, going on a blind date, starting a new job) were paired with captions that provide some explicit

information about the image (e.g. *"Entering an important exam", "Evaluating your date", "Starting a new job"*). The images (plus captions) were designed to set up different scenes that were not overly positive or negative. For each scene, we constructed absolutely positive statements (e.g. *"I'm 100% confident this exam will be a total success"*), absolutely negative statements (e.g. *"I'm 100% confident this exam will be a total failure"*), extremely positive statements (e.g. *"I'm fairly confident this exam will be a huge success"*) and extremely negative statements (e.g. *"I'm fairly confident this exam will be a huge failure"*). This means that for each scene (e.g. exam), there are four different statements. The statements were designed to be syntactically similar, but semantically different. Moreover, there statements were also designed to contain a probability portion (e.g. "I'm fairly confident…") and a magnitude portion (e.g. "*this exam will be a huge failure").* Participants were told that these were "self-talk statements; things you might say to yourself in a given situation". In the first part of the study, the absolutely positive statements were paired with the extremely positive statements for each scene, to form the main contrast for this study (Contrast 1). The absolutely negative statements were paired with the extremely negative statements to form the second contrast for this study (Contrast 2).

Contrast 1: Absolute Positive Statement vs. Extremely Positive Statement

Contrast 2: Absolute Negative Statement vs. Extremely Negative Statement

In the second part of the study, each statement was separated into two fragments, one fragment contained the probability portion (e.g. "I'm fairly confident…"), and the other fragment contained the magnitude portion (e.g. "*this exam will be a huge*

failure"). This means that for each scene (e.g. exam), where there had been four different statements, there were now eight different statement fragments.

Contrast 1:

Absolute Positive Probability Fragment

Absolutely Positive Magnitude Fragment

Extreme Positive Probability Fragment

Extreme Positive Magnitude Fragment

Contrast 2:

Absolute Negative Probability Fragment

Absolutely Negative Magnitude Fragment

Extreme Negative Probability Fragment

Extreme Negative Magnitude Fragment

Finally, the scenes were categorized into three groups; 'Social' (Date, Party, New Job), 'Core' (Doctor, Mugging, Unemployment), 'Achievement' (Future goals, Interview, exam, presentation).

7.3.1.3 Procedure

The first part of the study was separated into two blocks for contrast 1 and contrast 2. In the first block, participants were presented with statements from contrast 1. For each of the 10 scenes, participants were asked to decide which of the two statements describes the way they "would most prefer to think?". Participants made selections, by pressing "a" or "b" on a keyboard, corresponding with the statement they wanted

to select. In the second block, participants were presented with statements from contrast 2 and were asked to decide which of the two statements describes the way they "would least prefer to think?". There were no time restraints in either block; the experiment was delivered using E-prime 2.0 software, and the images depicting the scenes were located using google search (e.g. "exam pictures").

The second part of the study, was also separated into two blocks for contrast 1 statement fragments and contrast 2 statement fragments. In order to have a complete statement, participants needed to select a probability (e.g. "I'm fairly confident…") and a magnitude fragment (e.g. "*this exam will be a huge failure")*. These could both be absolutist, both extreme, or some mixture. In the first block, statement fragments from contrast 1 were presented for each scene and participants were asked to construct the statement they "would most prefer to think?". Participants made their selections, by pressing "a", "b", "c" or "d" on a keyboard, corresponding with the statement fragments they wanted to select. In order to construct a full statement, they must select at least two fragments. This was repeated in the second block for statement fragments from contrast 2, this time participants were asked to construct the statement they "would least prefer to think?"

7.3.1.4 Measures

Attribution Style Questionnaire. The ASQ (Peterson et al., 1982) presents scenarios for six positive and six negative outcomes (Appendix 16). Participants are instructed to make causal attributions for the outcomes and rate those causes on three 7-point scales: External/Internal (1 *totally due to other people or circumstances*, 7 *totally due to me*), Unstable/Stable (1 *will never again be present*, 7 *will always be present*), and

Specific/Global (1 *influences just this particular situation*, 7 *influences all situations in my life*). We calculated the total score for each of the positive and negative subscales separately. A high score on the ASQ negative subscale is purported to be depressogenic, while a high score on the ASQ positive subscale is purported to be protective against depressive symptoms. Our primary interest in administering this questionnaire was to measure absolute responding, which is calculated by summing the total number of absolute responses (i.e. 1 and 7 on the 7-point Likert scales). This resulted in an overall ASQ absolute responding score. We also calculated "explanatory flexibility", which is operationalized by Fresco, Rytwinski and Craighead (2007) as the standard deviation of each participant's responses to the stable and global subscales, for negative events on the ASQ. Like absolute responding, explanatory flexibility is said to be an indicator of participant flexibility, we would therefore expect a negative correlation between these metrics (i.e. high explanatory flexibility = low absolute responding).

Dysfunctional Attitude Scale. The DAS (Weissman, 1979) is designed to assess dysfunctional beliefs relating to social dependency, prerequisites for happiness, and perfectionism among other things (Appendix 17). It presents 40 statements to which participants respond on a 7-point scale (*totally disagree* to *totally agree*). A high score on the DAS suggests a high level of dysfunctional attitudes and consequently a greater vulnerability to depression. Our primary interest in administering this scale was to measure absolute responding; this was again calculated by summing the total number of absolute responses (i.e. 1 *totally agree* and 7 *totally disagree*). This resulted in an overall DAS absolute responding score.

Depression Anxiety and Stress Scale. The DASS (Lovibond & Lovibond, 1995) is a 42-item self-report measure which assesses the presence of depression (DASS-D), anxiety (DASS-A), and stress (DASS-S) symptoms (Appendix 21). Participants are asked to rate on a four-point scale how much each statement applied to them over the past week, scaling from 0 (does not apply to me at all) to 3 (applied to me very much or most of the time). The DASS has demonstrated good reliability and validity in non-clinical and clinical populations (Antony et al., 1998; Crawford and Henry, 2003). Cronbach's α for the Depression, Anxiety and Stress subscales were .96, .89, and .93, respectively (Brown et al., 1997).

7.3.2 Results

7.3.2.1 Part 1 Descriptive

For contrast 1, we found that participants selected the absolute positive statements as the most preferred option 26.72% (SD = 20.33) of the time and extreme positive statements 73.38% (SD = 20.33) of the time. For contrast 2, participants selected the absolute negative statements as the least preferred option 77.30% (SD = 30.94) of the time and extreme negative statements 22.71% (SD = 30.94) of the time. Therefore, participants believed that extreme positive statements were the most preferred way to think and absolute negative statements as the least preferred way to think.

7.3.2.2 Comparing 'social', 'core' and 'achievement'

Paired samples t-tests for the number of absolute positive statements selections in contrast 1, found significantly fewer absolute positive statements in social (M = 5.62%, SD = 7.81) than core (M = 10.01%, SD = 10.49) groups (t(44) = 2.379, p = .022). As well

as social and achieve (M = 11.11%, SD = 10.74) groups (t(44) = 2.394, p = .021). There were no significant differences between core and achieve groups (t(44) = .904, p = .371). Paired samples t-tests for the number of absolute negative statements selections in contrast 2, found no significance differences between social (M = 23.10%, SD = 10.03) and core (M = 22.97%, SD = 10.82) groups (t(44) = .256, p = .800), social and achieve (M = 31.37%, SD = 12.54) groups (t(44) = .428, p = .671) and also no significant difference between core and achieve groups (t(44) = .558, p = .580).

7.3.2.3 Part 2 Descriptive

For contrast 1, we found that participants selected the absolute positive statements as the most preffered option 32.45% (SD = 21.55) of the time and extreme positive statements 67.55% (SD = 21.55) of the time. For contrast 2, participants selected the absolute negative statements as the least preffered option 77.89% (SD = 24.20) of the time and extreme negative statements 22.11% (SD = 24.20) of the time. Therefore, once again participants believed that extreme positive statements were the most preferred way to think and absolute negative statements as the least preferred way to think.

7.3.2.4 Comparing 'social', 'core' and 'achievement'

Paired samples t-tests for the number of absolute positive statements selections in contrast 1, found significantly fewer absolute positive statements in social (M = 8.00%, SD = 6.86) than the core (M = 11.88%, SD = 7.41) group (t(44) = 3.875, p < .000). There was no significant difference between social and achieve (M = 12.50%, SD = 10.31) groups (t(44) = 1.614, p = .114) however there was between core and achieve group

(t(44) = 2.594, p = .013). Paired samples t-tests for the number of absolute negative statements selections in contrast 2, found a significance differences between social (M = 24.44%, SD = 9.12) and core (M = 21.67%, SD = 7.83) group (t(44) = 2.891, p = .006). There was no significant difference between social and achieve (M = 31.77%, SD = 9.66) group (t(44) = .596, p = .554) however there was between core and achieve group (t(44) = 2.702, p = .01).

7.3.2.5 Probability and Magnitude

For contrast 1, we found that 46% of participants constructed statements from fragments that were both extremely positive and only 11% of participants constructed statements from fragments that were both absolutely positive. Moreover, 24% of participants chose an absolute magnitude and an extreme probability fragment to construct statements, while 17% constructed statements using an absolute probability fragment and an extreme magnitude fragment. For contrast 2, we found that 8% of participants constructed statements from fragments that were both extremely negative and only 69% of participants constructed statements from fragments that were both absolutely negative. Moreover, 8% of participants chose an absolute magnitude and an extreme probability fragment to construct statements, while 15% constructed statements using an absolute probability fragment and an extreme magnitude fragment.

7.3.2.6 Questionnaires correlations

For the DAS, ASQ and DASS, we found that there was no significant correlation between the DAS and the ASQ negative subscale r(44) = −0.285 , *p* = .058, nor the ASQ

positive subscale r(44) = .089 , p = .563. There was a stronger correlation in response style, specifically, absolute responding between the DAS and the ASQ (r(44) = .668 , p < .001). Participants made absolute responses at both ends of these scales, that is, both absolute adaptive responses and absolute mal-adaptive responses, as defined by the measures (DAS and ASQ) themselves. We found that explanatory flexibility (variance in the ASQ) was positively correlated with both absolute responding on the DAS r(44) = .575, p > .001, and absolute responding on the ASQ itself r(44) = .819, p < .001.

7.3.3 Discussion

Extreme statements are preferred to absolute statements. Our results find that participants would prefer to be extremely, but not absolutely, positive. Ostensibly, it may have been predicted that since absolute positivity is objectively more positive than extreme positivity, participants could have preferred it. That is, participants would have selected the most positive option, which is absolute positivity. This is not what we find, indicating that individuals are willing to select less positive option which have other attractive features (i.e. more realistic or rational). Naturally, we found that absolute negativity was the "least preferred way to think", this asymmetry highlights the point further. While participants deemed absolute negativity the least preferred way to think, they did not correspondingly believe that absolute positivity was the most preferred way to think.

We identified that probability and magnitude claims are two of the principal ways in which individuals could be absolutist. In part 2 of study 1, our aim was to identify whether participants were more disposed to be absolutist about probability

or magnitude. Our findings show that more participants were likely to endorse absolute positive magnitude statement fragments as the most preferred way to think (24%), than absolute positive probabilities statement fragments (17%). Correspondingly, in contrast two, participants were more likely to endorse absolute negative probability statement fragments as the least preferred way to think (15%) compared to absolute negative magnitude statement fragments (8%). Overall, this shows that where absolutism was endorsed, it was more likely to be endorsed for magnitude rather than probability.

We also found that participants were less likely to endorse absolute statements in scenes depicting social situations (e.g. party) than those depicting achievement or a core scene. We cannot conclude too much from this finding as it is not what we had expected, we predicted that core scenes, due to their importance, may encourage participants to be more absolutist.

All participants completed the DAS and the ASQ. The former measures maladaptive attitudes and the latter measures maladaptive attributions, both purported to be cognitive vulnerabilities for depression. Consequently, we expected that the items on these measures would correlate. It was surprising therefore that our results show no significant correlation between these two measures. While the content of the DAS and the ASQ did not reliably correlate, there was a consistent and large correlation in response style. Specifically, absolute responding (selecting 1 + 7) on the DAS correlated with absolute responding on the ASQ. While absolute responding scores on the DAS and ASQ have been calculated in past studies (e.g. Teasdale et al., 2001; Peterson et al., 2007; Beevers, Miller, Keitner and Ryan, 2003;

Ching and Dobson, 2009; Forand and Derubeis, 2015), we are not aware of any correlation coefficients previously reported.

The standard deviation in ASQ scores on negative items (on the global and stable subscales) is said to reflect "explanatory flexibility". That is, low variation (standard deviation) in scores is considered an indication of maladaptive rigidity, while high variation is believed to denote adaptive flexibility. Previously reported empirical data has shown that explanatory flexibility (rather than ASQ scores) moderate the relationship of negative life events to levels of self-reported depression symptoms (Fresco, Rytwinski & Craighead, 2007). Paradoxically, we found that explanatory flexibility is positively correlated with absolute responding on the DAS and ASQ. As a result, it may be necessary to amend our inferences regarding absolute responding and explanatory flexibility. Previously it had been inferred that greater absolute responding on the ASQ and DAS also reflects more rigid thinking (e.g. Teasdale et al., 2001; Peterson et al., 2007), this may need to be revised. Alternatively, it may be that high variance on the ASQ may not actually reflect explanatory flexibility, as true flexibility is not well captured by simply calculating variance.

7.3.3.1 Future work

Regarding study 1, it may be interesting to replicate the findings using absolute positive and moderate negative statements (rather than extreme positive). In this way, the cost of not selecting the absolute positive option is not a slightly less positive option, but an overtly negative statement. This would better explore the extent to which participants are repelled by absolute positivity and attracted by perhaps more realistic options. Secondly, it would be profitable to replicate the findings on the ASQ

and DAS with regard to correlated response style and incongruences between 'explanatory flexibility' and absolute responding', in a larger sample.

7.4 STUDY 2

7.4.1 Method

7.4.1.1 Participants

A total of 46 undergraduate students were recruited from the University of Reading School of Psychology and Clinical Language Studies in exchange for course credit. Participants were predominantly female (88%) with an age range of 18-36 (Mean age = 20 years, SD = 5.84 years). Some level of depression, anxiety or stress was reported by 45.9% of the sample. All participants were recruited through the SONA system, which is an online portal that we used to advertise our study to internal students, manage sign-ups and reward participants with course credits. The study was reviewed by the University Research Ethics Committee and has been given a favorable ethical opinion for conduct. All participants read and signed an information sheet and consent form prior to participation.

7.4.1.2 Materials

In study 2, we continued to use absolute positive/negative and extreme positive/negative statements as before, however these were now simplified to only 4-5 words (e.g. "*I'm certain to fail"*). Therefore, for each scene, there were 4 such statements, these were presented to participants individually, without images or captions. The order of the statements of pseudorandomized and counterbalanced,

each appearing on the screen, for only 12 seconds. There was also a 12 second inter-stimulus interval (ISI) between each statement presentation, without jitter. The stimulus was delivered using E-prime 2.0.

7.4.1.3 Procedure

Participants were led into a testing cubicle, were they could view the stimulus on a computer monitor. They were asked to sit comfortably, and simply read the statements to themselves, as they appear on the screen. Before the task began, they were asked to wash and dry their hands, as we fit skin conductance electrodes to their left hand distal phalanges. They rested their arm on a cushion placed on their lap and their fingers hung freely off the edge. We also attached a finger pulse measure on their right hand (index finger). In this way, we recorded skin conductance and heart rate during the task. The task lasted less than 8 minutes from start to finish (40*12).

7.4.2 Results

The skin conductance response (SCR) data was processed using the 'Psycho-Physiological Modelling' (PSPM) program (Bach and Friston, 2013). We employed a non-linear (flexible latency and duration; event-related) analysis method, with normalization and a 'Butterworth' bandpass filter. We instituted a 17 second time window, this spanned the time from 2 seconds after stimulus presentation to 5 seconds before the end of the ISI. Our sample rate was 1k with a down sample of 10. Analysis was conducted using Matlab.

We conducted paired comparisons between the SCR's for absolute statements vs. extreme statements (collapsing for valence), as well as the SCR's for positive

statements vs. negative statements (collapsing for absolutism status) and the interaction between absolutism status and valence. We looked for difference in the SCR amplitudes, peak latency and dispersion, Table 7.1 displays the results of these paired contrasts.

Table 7.1 Test statistics for differences between amplitude, peak latency and dispersion, between absolute and negative statements.

mean	sem	t	*p*	df	Contrast name
-0.06	0.07	-0.8	0.427	43	Absol>Ext - Test: amplitude
0.11	0.07	1.66	0.104	43	P>N - Test: amplitude
0.08	0.05	1.54	0.1316	43	Inter - Test: amplitude
-0.04	0.23	-0.19	0.8512	43	Absol>Ext - Test: peak latency
0.38	0.22	1.76	0.0852	43	P>N - Test: peak latency
-0.84	0.29	-2.87	0.0063*	43	Inter - Test: peak latency
0.23	0.14	1.6	0.1168	43	Absol>Ext - Test: dispersion
-0.29	0.17	-1.67	0.1024	43	P>N - Test: dispersion
-0.44	0.17	-2.54	0.0148*	43	Inter - Test: dispersion

Absol = Absolute statements (both positive and negative collapsed)

Ext = Extreme statements (both positive and negative collapsed)

*$p < .05$

Running a contrast of absolute vs. extreme (collapsed across valence), shows no significant differences in amplitude (p = .427), latency (p = .851) or dispersion (p =

.117). But there were a couple of significant interactions for peak latency (p = .006) and dispersion (p = .015), which we investigated in the next set of contrasts.

To examine the interaction, we compared absolutely positive statements with extreme positive statements, and absolute negative statements with extreme negative statements. This was done for SCR amplitudes, peak latency and dispersion (see Table 7.2).

Table 7.2 Test statistics for differences between amplitude, peak latency and dispersion, between absolute positive and extreme positive statements.

mean	sem	t	p	df	Contrast name
-0.14	0.07	-2.04	**0.0474**	43	Ap>Ep - Test: amplitude
0.02	0.1	0.21	0.835	43	An>En - Test: amplitude
0.76	0.38	2.02	**0.0491**	43	Ap>Ep - Test: peak latency
-0.84	0.36	-2.34	0.0242	43	An>En - Test: peak latency
0.74	0.24	3.11	**0.0033**	43	Ap>Ep - Test: dispersion
-0.27	0.19	-1.38	0.1762	43	An>En - Test: dispersion

Ap = Absolute positive statements (both positive and negative collapsed)

Ep = Extreme positive statements (both positive and negative collapsed)

*$p < .05$

Looking at the difference between absolute vs. extreme within-valence results, it seems absolute positive conditions have significantly lower amplitude ($p = .047$), greater latency ($p = .049$) and greater dispersion ($p = .003$) than extreme positive. One interpretation is that while extreme positive appraisals are straightforwardly a good thing, absolute positive appraisals are confusing to participants. Superficially they are absolutely good, however we know from the behavioural data that participants don't like them. It may be that this ambiguity would produce the observed later peak onset, greater dispersion and reduced amplitude. Consistent with this is the lack of significance for negative valence (except latency). This would be expected to be the case as both absolute and extreme negativity are both straightforwardly bad.

Heart rate variability was analysed using the 'Kubios' (available at: http://kubios.uku.fi) software in combination with MATLAB. Here we found that RMSSD (root mean square of successive differences) does not correlate with absolute responding nor with depression scores.

Chapter 8: Absolutely Positive or Moderately Negative – Which is the Better Way to Think?

8.1 Introduction

In western cultures, having a positive attitude and an optimistic outlook is at the core of *pop*-psychology. This is perhaps best illustrated by the academy award winning song *Ac-Cent-Tchu-Ate the positive* (Johnny Mercer, 1944). Recently inducted into the Library of Congress for its "cultural, artistic and historical significance to American society" (Library of Congress, 2015), the lyrics recommend an absolute positive thinking style:

You've got to accentuate the positive;

Eliminate the negative;

Latch on to the affirmative;

Don't mess with Mister In-Between

Don't mess with Mister In-Between

In this study, we examine the extent to which participants agree with the songs sentiment; namely, that it is desirable to encourage an absolute positive outlook and eliminate negativity. By 'absolute', we mean a state of total positivity, removing all nuance, provisos and limitations. To a greater or lesser extent, we all produce absolutist thoughts occasionally. We are disposed to them, because their straightforward simplicity helps reduce cognitive load (Fiske and Taylor, 1984).

However, an absolute positive outlook could also be engendered through ideology; a basic belief that negativity is always unwelcome and absolute positivity leads to success.

The Mercer song is delivered in the style of a sermon, which is fitting, as much of the contemporary promotion of positive thinking is derived from an Evangelical Protestant ethic. For example, Norman Vincent Peale, the author of the highly influential and best-selling book "*The Power of Positive Thinking"* (1952), was a pastor at the Marble Collegiate Church in Manhattan. His influence stretched to the Oval Office, as both a friend to Nixon and a personal mentor to Donald Trump. Neither of whom are famed for their moderation, but Trump in particular cites Peale as a major influence.

In addition to pastors, there are countless motivational speakers, lifestyle guru's and success coaches that all advocate a similar form of positivity maximization and negativity elimination philosophy. In her best-selling book *The Secret* (2007), Byrne advances this viewpoint through the popular pseudo-scientific "law of attraction", which states that positive energy attracts positive energy. Although support for this form of irrational and absolute positivity is mercifully limited in the scientific community, its prevalence in the general population is not well understood.

In contrast, scientific proponents of positive thinking advocate a limited, rational and nuanced form of positivity. Scheier and Carver (1993) on the power of positive thinking, concede that it is "possible to be too optimistic" and that optimism could be detrimental in uncontrollable situations. Moreover, they argue that optimists are more likely to accept reality while pessimists deny negative situations exist – this suggests a radically different definition for positive thinking to that of *pop-*

psychology. Fredrickson (2005), another key advocate of positivity, argues that a "critical positivity ratio" greater than 11:1 (positive/negative) is maladaptive, signalling that there is some upper limit to positivity.

Empirically, too much positive thinking has repeatedly been linked to negative outcomes. Oettingen (1996) finds that unrealistic positive thinking is linked to negative outcomes in weight-loss. Baumeister (1989) finds that positive irrational beliefs "render the individual vulnerable to disconfirmation, which may be acutely unpleasant". Later, Baumeister et al., (2003) also demonstrate that boosting self-esteem of pupils does not improve academic performance and can be counterproductive. These findings were supported by Forsyth et al. (2007) who show that bolstering self-esteem of students resulted in worse exam scores for low achieving students. Multiple studies have found that positive thinking hinders entrepreneurial success (e.g. Bergen and Bressler, 2011; Balasuriya, Muradoglu and Ayton, 2010; Camerer and Lovallo, 1999), they argue that overconfidence and unrealistic expectations should be tempered to improve outcomes. Also in the social sphere, Anderson et al., (2006) finds that an inflated status and self-perception is associated with lower levels of social acceptance.

In emotion regulation, a developing consensus appears to be that neither positivity nor negativity are absolutely beneficial or detrimental. Hazlett, Molden and Sackett (2011) propose that individuals should shift flexibly between positive and negative thinking "based on the perceived value of each outlook". McNulty and Fincham (2012) describe how forgiveness, positive thinking, optimism and kindness can either benefit or harm well-being depending on the context. This is supported by a concept which has been termed "defensive pessimism", where individuals set low

expectations for stressful events to buffer anxiety and motivate preparation (Norem and Cantor, 1986). Consistent with the emphasis on flexibility, defensive pessimism is highly sensitive to context. For example, Shepperd, Oullette and Fernandez (1996) reveal that students progressively became more pessimistic as exams approached to "manage their anxiety". Finally, Wood, Perunovic and Lee (2009) found that repeating positive self-statements had a limited benefit to those that already had high self-esteem, but was detrimental to those with low self-esteem.

The link between positive thinking and good or bad outcomes appears to be strongly moderated by the factor of time. Specifically, irrational positive beliefs appear to only be beneficial in the short term and detrimental in the long term (Taylor and Brown, 1988). This is supported by Robins and Beer (2001) who found that although there were short term academic benefits to positive thinking in students; long term consequences reveal greater narcissism, decreased self-esteem and well-being. As well as greater disengagement with academia and lower performance. McNulty and Fincham (2012) analysed four longitudinal studies and found that positivity was associated with better wellbeing initially. However, it was found to be harmful over longer periods of time, therefore they argue that complete understanding can only be achieved by examining short- and long-term contextual implications.

In this study, we used a forced choice paradigm to present participants with a series of scenarios with ambiguous valence, each accompanied by an absolute positive statement and a moderate negative statement. Our main aim was to determine which they believe is the better way to think, and which is closer to the way they themselves think. The order of these questions was randomized as answers to one

question may impact the other. That is, stating the way you think may impact which you believe is the better way to think, or the reverse. As a secondary contrast, participants were shown absolute negative statements vs. moderate positive statements to the same scenarios; this provided balance and helped veil the aim of Contrast 1. For a third of participants, this second contrast was changed to absolute positive vs. moderate positive. Pilot data suggested that participants strongly prefer moderate positive statements over absolute positive statements, and that this may influence their choice in Contrast 1, by implicitly highlighting the irrationality of absolute positivity. Another third of participants were put into a time pressure condition. We believed that time pressure would result in more superficial choices (Evans, Handley and Bacon, 2009) and so a greater number of absolute positive selections.

We expected that participants who endorse more absolute positive statements could have a more general absolutist thinking style. That is, they would be more likely to make absolute responses on other measures. Participants were asked to complete the Attribution Style Questionnaire (ASQ) and the Dysfunctional Attitude Scale (DAS), both commonly used to measure cognitive vulnerability to depression. Teasdale et al., (2001) found that positive and negative "extreme responding" on these measures better predicts time to relapse in remitted depressed patients than their actual scores. Extreme responding (or what we will refer to more accurately as "absolute responding") is the tendency to endorse the absolute end-points on Likert type scales (i.e. 1 and 7 on a 7-point scale). This metric has been employed by others (e.g. Peterson et al., 2007; Forand and DeRubies, 2014) as a marker for rigid absolutist thinking and a possible cognitive vulnerability to depression. If endorsing absolute

positive statements in the behavioral task reflects a more general disposition towards absolutism, we might expect this to correlate with absolute responding to the ASQ and the DAS. Explanatory flexibility (variance on the ASQ) is another purported measure of flexibility; theoretically, high explanatory flexibility should correlate with lower absolute responding. Finally, participants also completed the Depression, Anxiety and Stress Scale (DASS), a 42-item questionnaire designed to measure three negative emotion states (depression, anxiety and stress). Partly this was to control for initial levels of negative emotions, but we also predicted that absolute responding on the ASQ and DAS would correlate with greater overall negative emotions, this was based on pilot data and previous studies (e.g. Teasdale et al., 2001).

8.2 Method

8.2.1 Participants

A total of 120 undergraduate students were recruited from the University of Reading School of Psychology and Clinical Language Studies in exchange for course credit. This sample size was based on expected effect sizes for differences between groups. Participants were predominantly female (83%) with an age range of 18-36 (Mean age = 20 years, SD = 2.4 years). Some level of depression, anxiety or stress was reported by 47.5% of the sample (Table 8.1). All participants were recruited through the SONA system, which is an online portal that we used to advertise our study to internal students, manage sign-ups and reward participants with course credits. The study was reviewed by the University Research Ethics Committee and has been given a favorable ethical opinion for conduct. All participants read and signed an information sheet and consent form prior to participation.

8.2.2 Materials

Ten different images depicting everyday scenes (e.g. taking an exam, going on a blind date, starting a new job) were paired with captions that provide some context to the image (e.g. *"You have done an average amount of revision", "You have only just met your blind date", "You just started a new job"*). The images (plus captions) were designed to set up different scenes that were not overly positive or negative. For each scene, we constructed absolutely positive statements (e.g. *"This exam is certain to be a total success"*), absolutely negative statements (e.g. *"This exam is certain to be a total disappointment"*), moderately positive statements (e.g. *"This exam might be rather successful"*) and moderately negative statements (e.g. *"This exam might be somewhat disappointing"*). The statements were designed to be syntactically similar, but semantically different. Participants were told that these were "self-talk statements; things you might say to yourself in a given situation". To validate the valence and the absolutist status of these scenes/statements, a subset of participants were asked to rate the scenes and statements for valence/absolutism (as appropriate) at the end of the study. Participants' ratings support our categorization of the statements (all 10 scenes, self-talk statements and ratings are available online at *10.6084/m9.figshare.5567044*). The absolutely positive statements were paired with the moderately negative statements for each scene, to form the main contrast for this study (Contrast 1). The absolutely negative statements were paired with the moderately positive statements to form the second contrast for this study (Contrast 2). For some participants, Contrast 2 was modified by combining absolute positive statements with moderate positive statements to form a modified Contrast 2

(Contrast 2b). The contrasts were presented to participants underneath the image and caption of each scene.

Contrast 1: Absolute Positive vs. Moderate Negative

Contrast 2: Absolute Negative vs. Moderate Positive

Contrast 2b: Absolute Positive vs. Moderate Positive

8.2.3 Procedure

Participants were asked two questions for each contrast, (Q1) "Which is the better way to think?" and (Q2) "Which is closer to the way you think?". The questions were presented in a block design and the block order was reversed for 50% of participants. This created two order groups, (order 1; N = 60) answered Q1 in the first block and Q2 in the second block, (order 2; N = 60) answered Q2 in the first block and Q1 in the second block. All participants had been fully briefed on both questions and the nature of the task, but were not told which block they would receive first. Each question was presented to participants only at the start of the block, followed by the scenes and relevant contrasts.

Participants were also randomized into one of three manipulation groups. Manipulation group 1 (N = 40) was presented with Contrast 1 and Contrast 2 for each scene. Manipulation group 2 (N = 40) was identical to manipulation 1, except they were put under time constraints. They were asked to respond as quickly as they could and informed that there was a 12 second time limit on responses. Manipulation group 3 (N = 40), was identical to manipulation 1, except they were presented with Contrast 1 and Contrast 2b (absolute positive vs. moderate positive). All participants

were therefore presented with two contrasts (1 + either 2 or 2b) for each scene, within each block. Participants made selections, by pressing "a" or "b" on a keyboard, corresponding with the statement they wanted to select. Finally, at the end of the task, participants were asked two write a short sentence outlining the motivation for their answers. Besides the time constraint imposed in manipulation group 2, progress through all aspects of the study was otherwise self-paced. The experiment was delivered using E-prime 2.0 software and the images depicting the scenes were located using google search (e.g. "exam pictures").

8.2.4 Measures

Attribution Style Questionnaire. The ASQ (Peterson et al., 1982) presents scenarios for six positive and six negative outcomes (Appendix 16). Participants are instructed to make causal attributions for the outcomes and rate those causes on three 7-point scales: External/Internal (1 *totally due to other people or circumstances*, 7 *totally due to me*), Unstable/Stable (1 *will never again be present*, 7 *will always be present*), and Specific/Global (1 *influences just this particular situation*, 7 *influences all situations in my life*). We calculated the total score for each of the positive and negative subscales separately. A high score on the ASQ negative subscale is purported to be depressogenic, while a high score on the ASQ positive subscale is purported to be protective against depressive symptoms. Our primary interest in administering this questionnaire was to measure absolute responding, which is calculated by summing the total number of absolute responses (i.e. 1 and 7 on the 7-point Likert scales). This resulted in an overall ASQ absolute responding score. We also calculated "explanatory flexibility", which is operationalized by Fresco, Rytwinski and Craighead

(2007) as the standard deviation of each participant's responses to the stable and global subscales, for negative events on the ASQ. Like absolute responding, explanatory flexibility is said to be an indicator of participant flexibility, we would therefore expect a negative correlation between these metrics (i.e. high explanatory flexibility = low absolute responding).

Dysfunctional Attitude Scale. The DAS (Weissman, 1979) is designed to assess dysfunctional beliefs relating to social dependency, prerequisites for happiness, and perfectionism among other things (Appendix 17). It presents 40 statements to which participants respond on a 7-point scale (*totally disagree* to *totally agree*). A high score on the DAS suggests a high level of dysfunctional attitudes and consequently a greater vulnerability to depression. Our primary interest in administering this scale was to measure absolute responding; this was again calculated by summing the total number of absolute responses (i.e. 1 *totally agree* and 7 *totally disagree*). This resulted in an overall DAS absolute responding score.

Depression Anxiety and Stress Scale. The DASS (Lovibond & Lovibond, 1995) is a 42-item self-report measure which assesses the presence of depression (DASS-D), anxiety (DASS-A), and stress (DASS-S) symptoms (Appendix 21). Participants are asked to rate on a four-point scale how much each statement applied to them over the past week, scaling from 0 (does not apply to me at all) to 3 (applied to me very much or most of the time). The DASS has demonstrated good reliability and validity in non-clinical and clinical populations (Antony et al., 1998; Crawford and Henry, 2003). Cronbach's α for the Depression, Anxiety and Stress subscales were .96, .89, and .93, respectively (Brown et al., 1997).

8.3 Results

8.3.1 Sample Characteristics

Sample characteristics are presented in Table 8.1. The sample comprised of mainly female undergraduate students at the University of Reading; there were no significant differences (all $p > .05$) between the groups in the proportion of female participants or the average age of the participant. There were also no significant differences (all $p > .05$) between the study groups in symptoms of depression, anxiety or stress. Finally, there were no significant differences (all $p > .05$) between the groups in their scores on the ASQ or DAS self-report scales, or the metrics derived from them, namely the AR and explanatory flexibility metrics.

Table 8.1 Classifications of depression, anxiety and stress symptom severity are derived from the standard DASS (Depression, Anxiety, Stress Scale) scoring template.

	Order 1 (N = 60)		Order 2 (N = 60)		Manipulation 1 (N = 40)		Manipulation 2 (N = 40)		Manipulation 3 (N = 40)	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Female gender	49	82%	52	86%	32	80%	33	83%	34	85%
Depression										
Normal	36	60%	41	68%	29	73%	27	68%	21	53%
Mild	2	3%	9	15%	3	8%	3	8%	5	13%
Moderate	13	22%	6	10%	7	18%	5	13%	7	18%
Severe	9	15%	4	7%	1	3%	5	13%	7	18%
Anxiety										
Normal	38	63%	40	67%	26	65%	27	68%	25	63%
Mild	4	7%	6	10%	7	18%	1	3%	2	5%
Moderate	9	15%	5	8%	4	10%	4	10%	6	15%
Severe	9	15%	9	15%	3	8%	8	20%	7	18%
Stress										
Normal	40	67%	43	72%	30	75%	27	68%	26	65%
Mild	8	13%	6	10%	5	13%	4	10%	5	13%
Moderate	5	8%	5	8%	2	5%	5	13%	3	8%
Severe	7	12%	6	10%	3	8%	4	10%	6	15%
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
ASQ Positive	4.89	0.65	5.10	0.52	5.04	0.62	5.06	0.64	4.89	0.52
ASQ Negative	4.42	0.70	4.19	0.66	4.16	0.58	4.29	0.82	4.47	0.63
DAS	181	45	188	26	183	39	182	38	190	34
AR	16.37	11.36	13.58	10.30	13.10	11.16	16.40	11.67	15.40	9.67
Explanatory Flexibility	1.42	0.40	1.41	0.41	1.43	0.38	1.43	0.38	1.39	0.45

Notes:

AR is calculated from the DAS and ASQ (sum end-point responses on the Likert scales). Explanatory flexibility is calculated from the ASQ (variance on ASQ). ASQ Positive = Attribution Style Questionnaire positive subscale; ASQ Negative = Attribution Style Questionnaire negative subscale; DAS = Dysfunctional Attitude Scale; AR = Absolute Responding.

8.3.2 Contrast 1: Absolute Positive or Moderate Negative

Q1 – Which is the better way to think?

In Contrast 1 (absolute positive statements vs. moderate negative statements), a two-way ANOVA was conducted to examine the effect of order and manipulation, on selecting absolute positive statements, as the better way to think. We found no statistically significant interaction between the effects of order and manipulation on selecting absolute positive statements, F (2, 114) = 0.485, p = .617, η_p^2 = .008. There was also no statistically significant main effect of manipulation, F (2, 114) = 1.804, p = .169, η_p^2 = .031, but there was a significant effect of order, F (1, 114) = 8.901, p = .003, η_p^2 = .072. Participants that were asked Q1 first (order 1), selected absolute positive statements as the better way to think significantly fewer times (M = 53.7%, SD = 2.3%) than those that were asked Q1 after having already answered Q2 (M = 67%, SD = 2.6%; Figure 8.1). We conducted one sample t-tests to determine whether there was a significant difference in the percentage of absolute positive and moderate negative statement selections (compared to 50%). We separately analysed order 1 and 2 as there was a main effect of order. For order 1, we found that the percentage of absolute positive statement selections (M = 53.7%, SE = 2.3%) and moderate negative statement selections (M = 46.3%, SE = 2.3%) were not significantly different from 50%, t(59) = 1.227, p = .225, d = .32. Both produced the same t and p values, as this is a forced choice paradigm. For order 2, we found that the percentage of absolute positive statement selections (M = 67%, SE = 2.6%) was significantly greater than 50%, and the percentage of moderate negative statement selections (M = 32.7%, SE = 2.6%) was correspondingly significantly lower than 50%, t(59) = 5.092, p < 0.001, d = 1.33.

This emphasizes the order effect; absolute positive statements were deemed the "better way to think", only in order 2 (Figure .1).

Q2 – Which is closer to the way you think?

In Contrast 1 (absolute positive statements vs. moderate negative statements), a two-way ANOVA was conducted to examine the effect of order and manipulation, on selecting absolute positive statements, as "closer to the way you think". There was no statistically significant interaction between the effects of order and manipulation on selecting absolute positive statements, F (2, 114) = 2.803, p = .065, η_p^2 = .047. There was also no statistically significant main effect of order, F (1, 114) = .008, p = .930, η_p^2 = .000, and only a marginally significant effect of manipulation, F (2, 114) = 3.517, p = .033, η_p^2 = .058. Pairwise comparisons with a Bonferroni correction found that manipulation group 1, selected fewer absolute positive statements (M = 23.5%, SD = 2.17%) than manipulation group 3 (M = 35%, SD = 2.1%, p = .044; Figure 8.1). As there was no effect of order and only a marginal effect of manipulation, we conducted a one-sample *t*-test (compared to 50%) using the full sample. We found that the percentage of absolute positive statement selections (M = 30.5%, SD = 2%) was significantly lower than 50% and the percentage of moderate negative statement selections (M = 69%, SD = 2.2%) was significantly greater than 50% t(119) = 9.639, p < .001, d = 1.77. The greater proportion of moderate negative statement selections in Q2, highlights a discrepancy between the way participants actually thought, and what they believed was the better way to think (Figure 8.1). Participants believed it was better to be more positive than they actually were, this was especially the case in order 2.

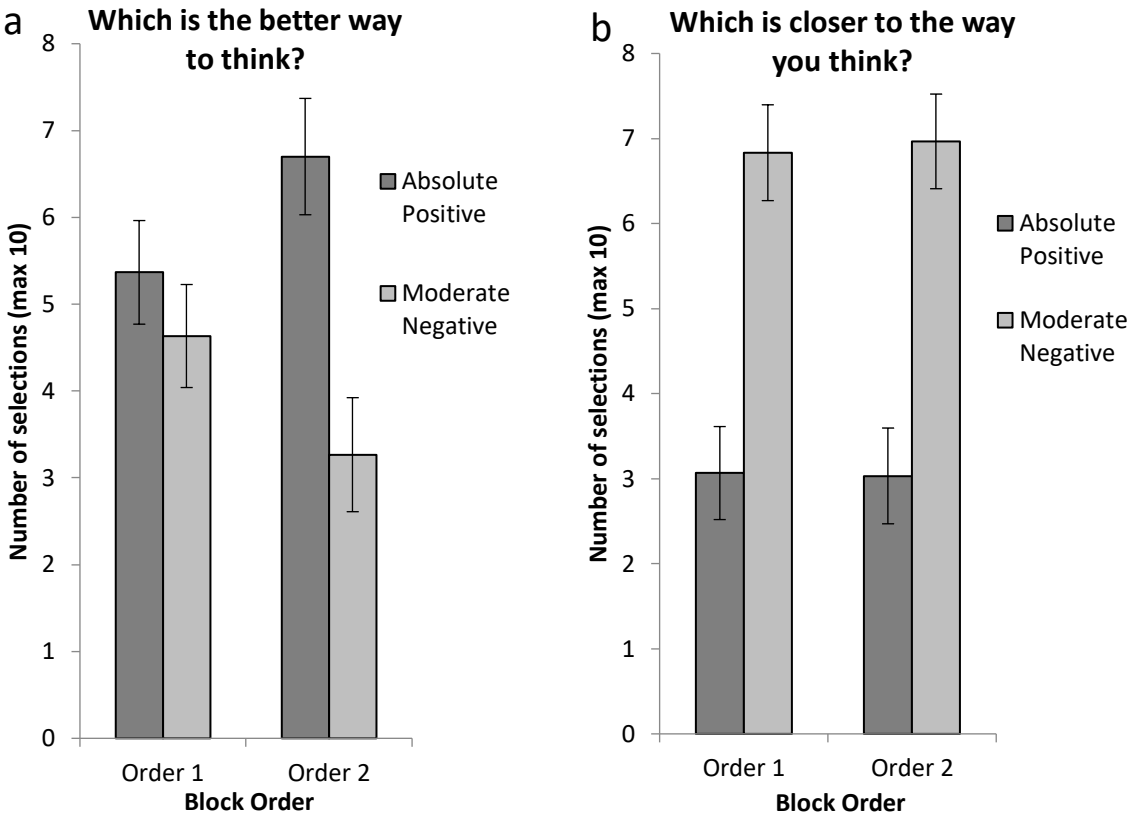

Figure 8.1 Figures presenting the mean number of absolute positive and moderate negative statement selections (contrast 1), for order 1 and order 2 groups.

A. Which is the better way to think? (Q1). B. Which is closer to the way you think? (Q2).

Order 1 = "Which is the better way to think?" asked before "Which is closer to the way you think"; Order 2 = "Which is the better way to think?" asked after "Which is closer to the way you think". Error bars represent 95% confidence intervals

8.3.3 Contrast 2: Absolute Negative or Moderate Positive

Q1 – Which is the better way to think?

In Contrast 2 (absolute negative statements vs. moderate positive statements), a two-way ANOVA was conducted to examine the effect of order and manipulation, on selecting absolute negative statements, as the better way to think. There was no statistically significant interaction between the effects of order and manipulation on selecting absolute negative statements F (1, 76) = 3.867, p = .053, η_p^2 = .048. There was also no statistically significant main effect for manipulation, F (1, 76) = 1.973, p = .164, η_p^2 = .025, and no statistically significant main effect for order, F (1, 76) = .009, p = .926, η_p^2 = .000. Naturally, participants overwhelmingly believed that moderate positivity was a better way to think than absolute negativity (Figure 8.2). Contrast 2 was only presented to participants in manipulation groups 1 and 2, not manipulation group 3. As there was no effect of order or manipulation, we conducted a one-sample t-test (compared to 50%) using the full sample. As expected for Q1, we found the percentage of absolute negative statement selections (M = 9%, SD = 1.3%) was significantly lower than 50% and the percentage of moderate positive statement selections (M = 91%, SD = 1.2%) was significantly greater than 50%, t(79) = 33.098, p < 0.001, d = 7.45.

Q2 – Which is closer to the way you think?

In Contrast 2 (absolute negative statements vs. moderate positive statements), a two-way ANOVA was conducted that examined the effect of order and manipulation, on selecting absolute negative statements, as "closer to the way you think". There was no statistically significant interaction between the effects of order and manipulation

on selecting absolute negative statements, F (1, 76) = .058, p = .810, η_p^2 = .001. The was also no statistically significant main effect for manipulation, F (1, 76) = 3.176, p = .079, η_p^2 = .040, and no statistically significant main effect for order, F (1, 76) = .188, p = .666, η_p^2 = .002 (Figure 8.2). Contrast 2 was only presented to participants in manipulation groups 1 and 2, not manipulation group 3. For Q2, as there was no effect of order or manipulation, we conducted a one-sample *t*-test (compared to 50%) using the full sample. We found that the percentage of absolute negative statement selections (M = 26.6%, SD = 2.6%) was significantly lower than 50% and the percentage of moderate positive statement selections (M = 74%, SD = 2.4%) was significantly greater than 50%, t(79) = 9.744, p < 0.001, d = 2.19.

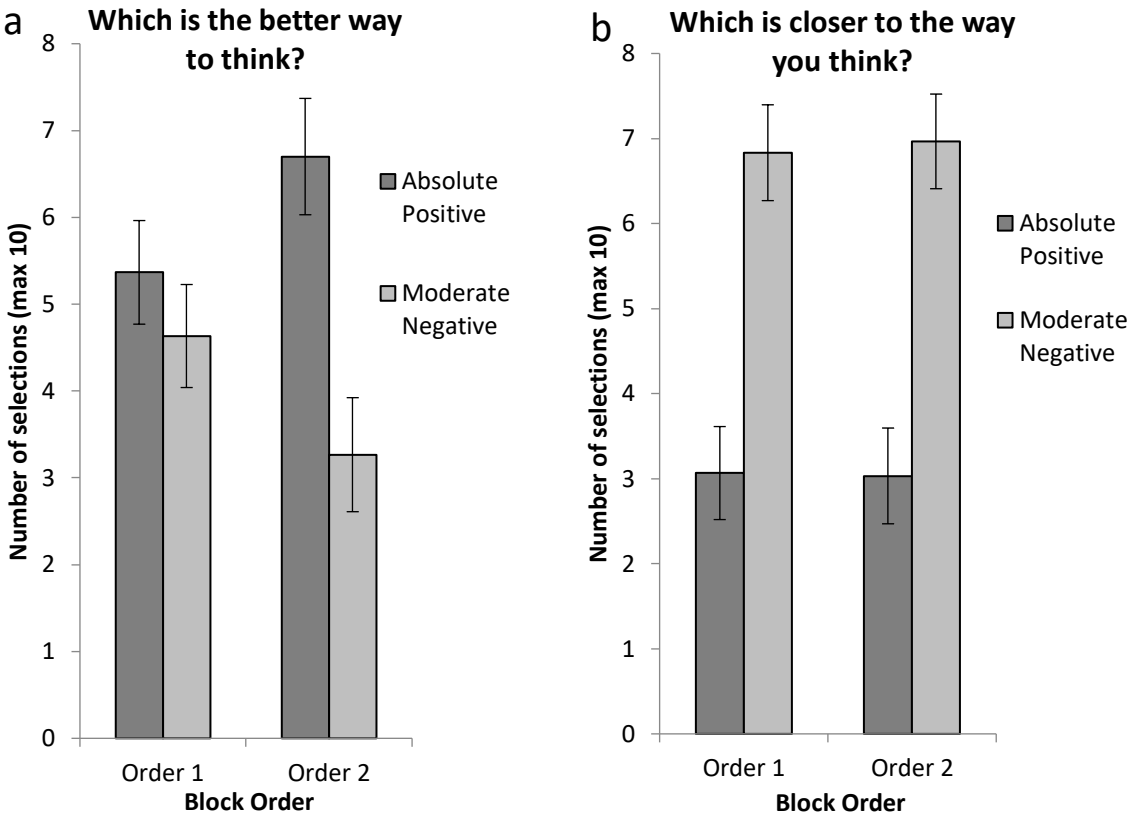

Figure 8.2 Figures presenting the mean number of absolute negative and moderate positive statement selections (contrast 2), for order 1 and order 2 groups.

A. Which is the better way to think? (Q1). B. Which is closer to the way you think? (Q2). Figure C and D present the mean number of absolute positive and moderate positive statement selections (contrast 2b), for order 1 and order 2 groups. C. Which is the better way to think? (Q1). D. Which is closer to the way you think?

Order 1 = "Which is the better way to think?" asked before "Which is closer to the way you think"; Order 2 = "Which is the better way to think?" asked after "Which is closer to the way you think". Error bars represent 95% confidence intervals

8.3.4 Contrast 2b: Absolute Positive or Moderate Positive

Q1 – Which is the better way to think?

Contrast 2b (absolute positive statements vs. moderate positive statements) was only presented to manipulation group 3. When asked which is the better way to think, an independent samples t-test found that participants that were asked Q1 first (order 1), selected absolute positive statements as the better way to think significantly fewer times (M = 25.5%, SD = 1.6%) than those that were asked Q1 after having already answered Q2 (M = 47.5%, SD = 2.4%), t(38) = 2.717, p = .01, d = .88. This mirrors the findings for Contrast 1 (Figure 8.2). We conducted a one sample t-test to determine whether there was a significant difference in the percentage of absolute positive and moderate positive statement selections (compared to 50%). We separately analysed order 1 and 2 as there was a main effect of order. For order 1, we found that the percentage of absolute positive statement selections (M = 25.5%, SD = 1.6%) was significantly lower than 50% and the percentage of moderate positive statement selections (M = 74.5%, SD = 1.6%) was significantly greater than 50% t(19) = 6.826, p < .001, d = 3.13. For order 2, we found that the percentage of absolute positive statement selections (M = 47.5%, SD = 2.4%) was not significantly different from 50% and the percentage of moderate positive statement selections (M = 52.5%, SD = 2.4%) was also not significantly different from 50%, t(19) = .457, p = .653, d = .21. As with Contrast 1, this emphasizes the order effect in Q1; a higher percentage of absolute positive statements were deemed the "better way to think" in order 2 than in order 1 (Figure 8.2).

Q2 – Which is closer to the way you think?

Finally, in Contrast 2b (absolute positive statements vs. moderate positive statements), an independent samples t-test found that there was no significant difference in the selection of absolute positive statements for Q2, between participants that were asked Q1 first (order 1; M = 18%, SD = 1.5%), and those asked Q1 after having already answered Q2 (order 2; M = 22.5%, SD = 1.7%), t(38) = .865, p = .393, d = .28; Figure 8.2. We therefore conducted a one-sample t-test (compared to 50%) using the full sample. We found the percentage of absolute positive statement selections (M = 20.3%, SD = 1.6%) was significantly lower than 50% and the percentage of moderate positive statement selections (M = 80%, SD = 2.6%) was significantly greater than 50%, t(39) = 11.469, p < 0.001, d = 3.67 (Figure 8.2).

8.3.5 Correlations between questionnaires

There was a small but significant correlation between the DAS and the ASQ negative subscale r(118) = -.287 , p = .001, as well as the ASQ positive subscale r(118) = -.255 , p = .005. There was however a stronger correlation in response style, specifically, absolute responding (selecting absolute end points on the 7 point Likert scales) between the DAS and the ASQ r(118) = .445, p > .001. Participants made absolute responses at both ends of these scales, that is, both absolutely adaptive responses and absolutely mal-adaptive responses, as defined by the measures (DAS and ASQ) themselves. Additionally, we found that explanatory flexibility (standard deviation on ASQ) was positively correlated with both absolute responding on the DAS r(118) = .242, p = .008, and absolute responding on the ASQ itself r(118) = .522, p > .001. This paradoxically suggests that absolutism in both the DAS and ASQ (believed to reflect

rigidity) is linked to greater explanatory flexibility (Table 8.2). It may be that absolute responding on the DAS and ASQ does not actually relate to rigidity, or that variance on the ASQ does not actually reflect flexibility, or both.

8.3.6 Correlations between questionnaires from unpublished data

To test the findings from this study, we re-analysed previously unpublished data from our lab where the DAS, ASQ and DASS had been administered to a similar sample of 46 undergraduate participants (mean age = 20 years, 79% female). We found that there was no significant correlation between the DAS and the ASQ negative subscale $r(44) = -0.285$, $p = .058$, nor the ASQ positive subscale $r(44) = .089$, $p = .563$. Again, there was a stronger correlation in response style, specifically, absolute responding between the DAS and the ASQ ($r(44) = .668$, $p < .001$). As before, participants made absolute responses at both ends of these scales, that is, both absolute adaptive responses and absolute mal-adaptive responses, as defined by the measures (DAS and ASQ) themselves. We again found that explanatory flexibility (variance in the ASQ) was positively correlated with both absolute responding on the DAS $r(44) = .575$, $p > .001$, and absolute responding on the ASQ itself $r(44) = .819$, $p < .001$. This completes the full replication of findings from our original data set using a previously unpublished data set, collected from a similar undergraduate sample (Table 8.3).

Table 8.2 Pearson correlations for the present data set.

		1	2	3	4	5	6	7	8	9	10	11	12	13
DASS(D)	**1**	-												
DASS(A)	**2**	.76**	-											
DASS(S)	**3**	.75**	.81**	-										
DAS	**4**	-.39**	-.34**	-.37**	-									
DAS(AR)	**5**	-.07	.03	-.08	.30**	-								
ASQ(P)	**6**	-.22*	-.22*	-.12	.26**	.14	-							
ASQ(N)	**7**	.35**	.24**	.30**	-.29**	.04	-.10	-						
ASQ(AR)	**8**	.06	.11	.08	-.04	.45**	.16	-.02	-					
ASQ(F)	**9**	-.09	-.01	-.04	.12	.24**	.04	-.18*	.52**	-				
Q1(AbsolP)	**10**	-.02	-.08	-.07	-.04	.02	-.13	.01	.04	.10	-			
Q1(ModN)	**11**	.02	.08	.08	.04	-.02	.13	-.02	-.04	-.11	-1**	-		
Q2(AbsolP)	**12**	-.11	-.14	-.17	.14	.25**	.15	-.16	.18*	.08	.08	-.08	-	
Q2(ModN)	**13**	.11	.14	.20*	-.14	-.25**	-.14	.15	-.17	-.12	-.05	.07	-.97**	-

Notes:

DASS = Depression, Anxiety and Stress Scale; DASS(D) = Depression subscale; DASS(A) = Anxiety subscale; DASS(S) = Stress subscale; DAS = Dysfunctional Attitude Scale; ASQ = Attribution Style Questionnaire; ASQ(P) = Positive subscale; ASQ(N) = Negative subscale; AR = Absolute Responding; ASQ(F) = Explanatory flexibility; Q1 = Which is the better way to think; Q2 = Which is closer to the way you think; AbsolP = Absolute positive; ModN = Moderate negative.

** Correlation is significant at the $p < .01$ level (2-tailed)

* Correlation is significant at the $p < .05$ level (2-tailed)

Table 8.3 Pearson correlations for the unpublished data set.

		1	2	3	4	5	6	7	8	9
DASS Dep	**1**	-								
DASS Anx	**2**	.66**	-							
DASS Stress	**3**	.61**	.76**	-						
DAS	**4**	-.14	-.12	-.15	-					
DAS (AR)	**5**	.11	.06	-.08	.33*	-				
ASQ Pos	**6**	-.22	-.26	-.24	.09	.15	-			
ASQ Neg	**7**	.16	.06	-.03	-.29	.21	-.06	-		
ASQ (AR)	**8**	.30*	.37*	.19	.02	.67**	.29*	.21	-	
ASQ Flex	**9**	.07	.19	.06	.06	.50**	.46**	-.15	.68**	-

Notes:

DASS = Depression, Anxiety and Stress Scale; DASS(D) = Depression subscale; DASS(A) = Anxiety subscale; DASS(S) = Stress subscale; DAS = Dysfunctional Attitude Scale; ASQ = Attribution Style Questionnaire; ASQ(P) = Positive subscale; ASQ(N) = Negative subscale; AR = Absolute Responding; ASQ(F) = Explanatory flexibility.

** Correlation is significant at the $p < .01$ level (2-tailed)

* Correlation is significant at the $p < .05$ level (2-tailed)

8.3.7 Correlations between absolute responding on questionnaires and statements

We found that when participants were asked Q2 ("Which is closer to the way you think?"), their tendency to endorse absolute positive statements correlated significantly with greater absolute responding on the DAS r(118) = .252, p = .005, and the ASQ r(118) = .179, p = .05. Crucially, for Q1 ("Which is the better way to think?"), there was no significant correlation between the number of absolute positive responses and absolute responding on the DAS r(118) = .022, p = .813, or the ASQ r(118) = .044, p = .635. This suggests that absolute responding on the DAS and ASQ may reflect an absolutist thinking style, rather than simply a questionnaire response style (Table 8.2).

8.4 Discussion

In the absolute positive vs. moderate negative contrast, we find a marked discrepancy between the way participants actually think, and the way they believe they ought to think. While most responses for Q2 (which is closer to the way you think?) selected moderately negative statements over absolutely positive statements; this pattern disappeared, or was reversed for Q1 (which is the better way to think?). Participants generally believe they ought to think more positively, even selecting clearly irrational absolutely positive self-talk statements for ambiguous situations. This may be the result of a widespread notion, in western culture, that a positive outlook is an unmitigated good, and even a moderate negative outlook is ideally avoided. Interestingly, participants concede that they do not actually choose to think this way, when forced to decide, they generally identified moderate negativity as closer to the way they actually think. This discrepancy is best illustrated in the written explanations

participants provided after the behavioral task. For example, one participant wrote "*I try and think more rationally about situations*" to justify their answers to Q2, but later wrote "*I chose more positive answers for the way we should think about situations*" to justify their answers to Q1. This was typical of the sort of remarks participants made (full list of anonymized remarks is available online; *10.6084/m9.figshare.5567041*). For Contrast 2b, moderate negative was replaced with moderate positive. For Q1, participants believed it was better to be moderately positive than absolutely positive (64% and 36%, respectively). The 24% drop in absolute positive selections compared to Contrast 1 suggests that avoiding negativity was a major motivating factor for that contrast. As with Contrast 1, participants generally favored the moderate option as being closer to the way they think.

The order in which the questions (Q1, Q2) were asked had a significant effect on the extent to which participants endorsed absolute positivity. Participants in order 1 (n = 60) were asked Q1 first, and were significantly less disposed towards absolute positivity on Q1 than participants in order 2 (n = 60). It seems that for order 2, having reflected on which is closer to the way they think (Q2) first, encouraged significantly more absolute positive responses on Q1 (Figure 8.1). This supports past research which has shown that the more participants focus on themselves, the more unrealistically optimistic they become (e.g. Weinstein and Lachendro, 1982; Kruger and Burrus, 2004). In Contrast 2b, participants were once again more likely to endorse absolute positive statements for Q1, if they had been asked Q2 first. Overall, the effect of reflection on how they themselves think, systematically encourages participants to endorse absolute positive statements as the better way to think.

All participants completed the DAS and the ASQ. The former measures maladaptive attitudes and the latter measures maladaptive attributions, both purported to be cognitive vulnerabilities for depression. Consequently, we expected that the items on these measures would correlate. Our findings are mixed, while the present data set found a weak but significant correlation between the DAS and both the positive and negative subscales of the ASQ (Table 8.2), our previously unpublished data (with smaller sample size) failed to corroborate this finding (Table 8.3). Past studies have reported similar mixed findings; some studies found significant correlations with modest effect sizes (e.g. Ciesla and Roberts, 2007; Enggasser and Young, 2007), others found no significant correlations (e.g. Barber and DeRubeis, 2001). While the content of the DAS and the ASQ did not reliably correlate, there was a consistent and medium/large correlation in response style. Specifically, absolute responding (selecting 1 + 7) on the DAS correlated with absolute responding on the ASQ. This was the case for both the present data set, and our labs previously unpublished data (Table 8.2 and 8.3). While absolute responding scores on the DAS and ASQ have been calculated in past studies (e.g. Teasdale et al., 2001; Peterson et al., 2007; Beevers, Miller, Keitner and Ryan, 2003; Ching and Dobson, 2009; Forand and Derubeis, 2015), we are not aware of any correlation coefficients previously reported.

The standard deviation in ASQ scores on negative items (on the global and stable subscales) is said to reflect “explanatory flexibility”. That is, low variation (standard deviation) in scores is considered an indication of maladaptive rigidity, while high variation is believed to denote adaptive flexibility. Previously reported empirical data has shown that explanatory flexibility (rather than ASQ scores) moderate the

relationship of negative life events to levels of self-reported depression symptoms (Fresco, Rytwinski & Craighead, 2007). Paradoxically, we found that explanatory flexibility is positively correlated with absolute responding on the DAS and ASQ. This means that greater rigidity implied by one measure (absolute responding) results in greater flexibility implied by the other (explanatory flexibility); this was found in both the present data set, and our previously unpublished data set (Table 8.2 and 8.3). As a result, it may be necessary to amend our inferences regarding absolute responding and explanatory flexibility. Previously it had been inferred that greater absolute responding on the ASQ and DAS also reflects more rigid thinking (e.g. Teasdale et al., 2001; Peterson et al., 2007), this may need to be revised. Alternatively, it may be that high variance on the ASQ may not actually reflect explanatory flexibility, as true flexibility is not well captured by simply calculating variance. Ideally, flexibility should not be measured by repurposing the ASQ, but rather through existing (Martin & Rubin, 1995; Dennis & Vander Wal, 2010) or new instruments specifically targeted at that construct.

Finally, we found that participants that had greater absolute responding scores on the DAS and the ASQ, also selected more absolute positive statements as being closer to the way they think (Q2, Table 8.2). There was no correlation of this kind for which they believed was the better way to think (Q1). This suggests that absolute responding reflects actual absolutist thinking, and is not simply a response style.

8.4.1 Limitations and Future Research

Our study employed a sample of British university students, mostly female and mostly young. It would be interesting to see how results would differ using samples that are

predominantly male, older or from different cultures. It could be hypothesised that eastern cultures, which place a greater emphasis on moderation ("the middle way") and less emphasis on positive thinking (Matthews, 2000; Yamazaki and Kayes, 2010), may produce fewer absolute positive statement selections for both Q1 and Q2.

Chapter 9: Absolute Rigidity – When Greater Discrepancy Produces Less Change?

9.1 Chapter overview

In this study, we investigate the relationship between appraisal extremity and appraisal rigidity. On a visual analog scale, ranging from 0 (absolutely positive) to 100 (absolutely negative), participants were asked to rate a series of polarizing personalities (e.g. Donald Trump). They then received new information about those personalities, which conflicted with their initial rating. Participants were asked to rate the personalities a second time, having considered the new conflicting information. Perversely, we found that the conflicting information had the least impact where there was the greatest discrepancy between it and the initial rating. That is, the very responses which had the most reason to change, changed the least. We further found that absolute negative responses, were the most rigid of all.

9.2 Introduction

Thoughts and beliefs which are absolute, have no nuance or ambiguity. All the complexities of a given topic are reduced to the most simple and absolute state (e.g. "It will definitely rain today"). A certain propensity for absolutist thinking resides in everyone, to one degree or another. It pervades every aspect of people's lives, from the personal to the societal; in politics, culture, religion and mental health. Surprisingly little research has directly addressed absolutist thinking in these areas. In politics, absolutism has been studied in the context of right-wing authoritarianism. It

has more extensively been studied with respect to certain mental health conditions; namely, suicidal ideation, borderline personality disorder and eating disorders (Al-Mosaiwi and Johnstone, 2018; Neuringer, 1964; Pollock and Williams, 2004; Wedding, 2000).

The most convincing explanation for the presence of absolutist thinking is the 'cognitive miser' hypothesis, which argues that individuals will seek simple and less effortful answers in place of sophisticated and effortful ones. In this way, absolutist thinking is an attractive heuristic which reduces complexity and computational load (Fiske and Taylor, 1984). The benefits of simplicity however are accompanied by inherent costs. The first, is that absolutist beliefs are fundamentally inaccurate, life is rarely so simple. They are often irrationally extreme in their claims, and this level of inaccuracy could reasonably be supposed to lead to negative consequences. The second (and the focus of this study), is that absolutist beliefs may also be the most rigid. One could suppose that given their extreme claims and simplicity, they would be quite susceptible to the influence of new information; as opposed to beliefs which are already nuanced and moderate.

There has been relatively little empirical research examining the rigidity of absolutist thinking. Past studies into cognitive rigidity have largely required participants to make wholesale changes in attention or ideas, rather than gradual adjustments. These involve executive functioning tests such as task switching or cognitive shifting (e.g. Wisconsin card sorting test). Moreover, many of these executive functioning tasks lack ecological validity. In this study, we ask participants to rate well-known and polarizing personalities (e.g. Donald Trump) on a visual analog scale with absolute end-points (totally positive – totally negative). They are then

permitted to change their rating, after receiving new information which conflicts with their initial response (i.e. positive information about a negatively rated celebrity). We predict that absolute initial responses (i.e. totally positive or totally negative) will be the least likely to change in light of new information. This study is designed to ensure that absolute initial responses have the most reason to be amended, as they will conflict most with the new information. Nevertheless, we predict that in spite of this, absolute responses will prove to be the most rigid.

9.3 Method

9.3.1 Participants

A total of 180 undergraduate students were recruited from the University of Reading School of Psychology and Clinical Language Studies in the UK for an online study. Two participants failed to complete any part of the study, and were removed from the sample. Participants were predominantly female (87%) with an age range of 18-40 (Mean = 20 years, SD = 2.5 years). All participants were recruited through the SONA system, which is an online portal that we used to advertise our study to internal students, manage sign-ups and reward participants with course credits. The study was reviewed by the University Research Ethics Committee and has been given a favorable ethical opinion for conduct. All participants read and signed an information sheet and consent form prior to participation.

9.3.2 Stimuli

In this study, we identified 6 well-known personalities that were highly likely to be viewed negatively by our cohort of undergraduate students. These formed the

'negative condition' and were Nigel Farage, Donald Trump, Katie Hopkins, Chris Brown, Katie Price and Kim Kardashian. We also identified 6 well-known personalities that were highly likely to be viewed positively by our cohort of undergraduate students. These formed the 'positive condition' and were Ellen DeGeneres, Beyoncé Knowles, David Beckham, Will Smith, Adele and Barack Obama. In the negative condition, unflattering pictures of the celebrities were presented along with their name, while in the positive condition, we used flattering pictures. The positive and negative personalities were presented sequentially to participants, alternating between positive and negative, in a pseudorandomized order. The study was hosted by 'SurveyMonkey', an online survey development cloud-based software company. Participants were given an online address from which they could access and complete the study.

9.3.3 Task

For each well-known personality, participants were asked if they had heard of them previously ("yes"/"no"). They were then asked to "indicate your view of" that given famous personality, on a visual analog scale ranging from totally positive (0) to totally negative (100). Immediately following this rating, participants were presented with a short passage of information intended to conflict with their initial rating. That is, positive information was presented for the negative condition (e.g. Donald Trump) and negative information was presented for the positive condition (e.g. Beyoncé Knowles). Naturally, some participants may have made positive initial ratings in negative conditions (or vis versa), we predicted such responses would be rare exceptions. Participants were next asked whether they had already known the

information presented ('Yes'/'No'), as it was intended to be new. They were also asked whether they believed the information presented, and they responded on a 5-point Likert scale ranging from 'Definitely true' to 'Definitely false'. The new information about a given well-known personality was sourced from newspapers and magazine articles. For the negative condition, we are reasonably confident that the positive information provided is indeed true, as it is cited by several reputable outlets. This was less the case for the positive condition, where negative information was presented, because we mostly resorted to gossip magazines. After reading the new and likely conflicting information about the given well-known personality, participants were asked to once again indicate their view of them on the same analog scale. The images used in this study are available in Appendix 22.

9.3.4 Data Analysis

In this study, we are interested in the difference between those who make absolute initial responses and those who make non-absolute initial responses. A rating of either 0 or 100 (i.e. 'totally positive' or 'totally negative') is classified is absolute, and all other ratings are classified as non-absolute. On our visual analogue scale, we found that ratings of 1 and 99, although technically not absolute, were visually indistinguishable from ratings of 0 and 100 respectively. For this reason, we grouped responses of 0-1 and 99-100 as absolute. Additionally, we determined that responses from 2-10 and 90-98, would be classed as "extreme", but not absolute. The "extreme" group occupied the top and bottom 10% of the analog scale, which wasn't already assigned as absolute. All other responses were classified as "moderate" except 50 which was classified as "neutral".

The difference between the initial rating of a given famous personality, and the second rating after absorbing the new conflicting information about them, was defined as the 'change score'. A change score was calculated for every personality rated by each participant. Responses were excluded from the analysis if they did not fit the condition valence (i.e. positive ratings for negative personalities, or vice versa), also if the participant indicated that they did not know the famous personality or already knew the conflicting information presented about them. Responses were also excluded if the change score was in opposition to the valence of the new information (i.e. the rating becomes more positive after negative information about the personality is presented, or vice versa). To analyze the data, a linear mixed-effects modelling approach was adopted (see Appendix 1 for the SPSS syntax script). This is the recommended analysis method for this type of data structure (Baayen, Davidson, & Bates, 2008). Our fixed factor is the initial response group (absolute, extreme or moderate), our dependent variable is the change score, and our random factor is the participants. Mixed-effects models consider both fixed and random effects and can be used to assess the influence of the fixed effects on the dependent variable after accounting for random effects (namely, correlated residuals in responses from the same participant). Analysis was conducted using IBM SPSS software (version 21). We report raw values for descriptive statistics to facilitate a more intuitive understanding.

9.4 Results

Based on the exclusion criteria outlined in the data analysis section, 746 responses out of a total of 2136 (178 participants * 12 celebrities) were removed from the analysis,

leaving 1390 responses. There were no significant differences in age, or the proportion of female participants, between the initial ratings groups (all *p*'s > .05).

A linear mixed effects model showed that initial ratings had a significant effect on the extent to which participants believed new conflicting negative information about positively rated celebrities (belief score); F (2, 750) = 27.563, $p < .000$. As outlined, the belief score ranged from 1 = "Definitely true" to 5 = "Definitely false". Paired comparisons show that the average belief score of absolute initial ratings (M = 3.25, SD = .87) was significantly greater than for moderate initial ratings (M = 2.74, SD = .79, $p < .000$), but not significantly different from extreme initial ratings (M = 3.08, SD = .83, $p = .103$). Extreme initial ratings also had a belief score significantly greater than moderate initial ratings ($p < .000$). Therefore, responses with absolute or extreme initial ratings, were more likely to disbelieve conflicting information about positively rated celebrities.

A linear mixed effects model also showed that initial ratings had a significant effect on the extent to which participants believed new conflicting positive information about negatively rated celebrities; F (2, 494) = 22.817, $p < .000$. Paired comparisons show that the belief score of absolute initial ratings (M = 2.90, SD = 1.06) was significantly greater than for both extreme (M = 2.60, SD = .80, $p = .008$) and moderate initial ratings (M = 2.39, SD = .69, $p < .000$). Extreme initial ratings did not have a significantly different belief score from moderate initial ratings (p = .118). Overall, participants with absolute initial ratings were more likely to disbelieve conflicting information. Because there was a difference in belief scores between different initial rating groups, we include belief scores as a covariate in all subsequent

analyses. We also applied a Bonferroni correction throughout, to account for multiple comparisons.

In the positive condition, a linear mixed effects model found that initial ratings had a significant effect on 'change scores', controlling for belief scores; $F(2, 750) = 11.498$, $p < .000$ (Figure 9.1). Paired comparisons show that the average change score of absolute initial ratings ($M = 5.95$, $SD = 9.61$) was significantly lower than for moderate initial ratings ($M = 9.28$, $SD = 8.62$, $p < .000$), but not significantly different from extreme initial ratings ($M = 6.77$, $SD = 7.65$, $p = .623$). Extreme initial ratings also had a significantly lower change score than moderate initial ratings ($p < .010$). Overall, for positive ratings about popular celebrities, the new conflicting information, had a greater impact on change scores for moderate initial ratings, than extreme or absolute initial ratings.

In the negative condition, a linear mixed effects model found that initial ratings had a significant effect on 'change scores', controlling for belief scores; $F (2, 488) = 47.458$, $p < .000$ (Figure 9.1). Paired comparisons show that the average change score of absolute initial ratings ($M = -1.74$, $SD = 4.70$) was significantly lower than for extreme ($M = -5.36$, $SD = 7.62$, $p = .002$) and moderate ($M = -8.44$, $SD = 7.69$, $p < .000$) initial ratings. Extreme initial ratings also had a change score significantly lower than moderate initial ratings ($p = .001$). Overall, for negative ratings about unpopular celebrities, the new conflicting information, had the least impact on change scores for absolute initial ratings.

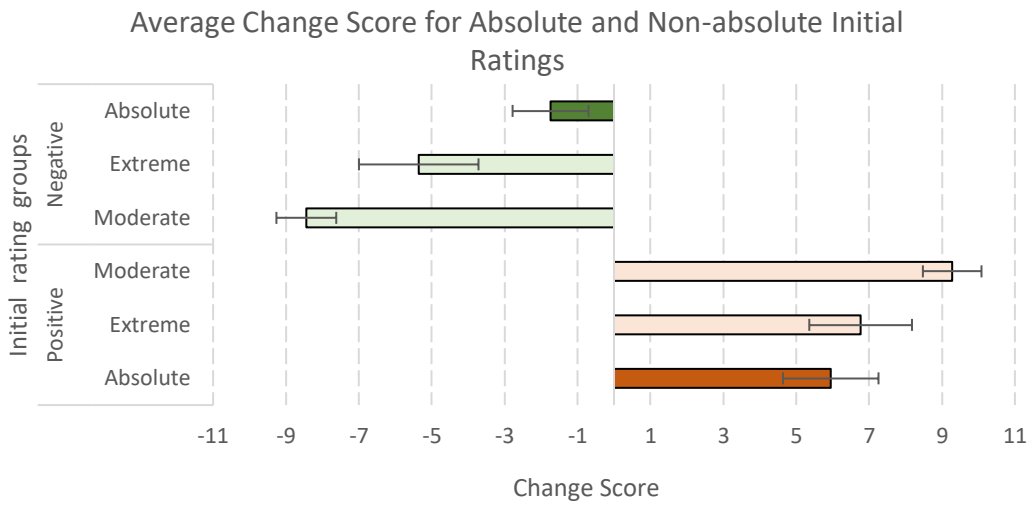

Figure 9.1 Average change score for 'Absolute', 'Extreme' and 'Moderate' initial rating groups, split by positive and negative conditions. Error bars indicate ± 95% confidence intervals.

An independent samples t-test found a significant difference in the average change score between absolute positive initial ratings and absolute negative initial ratings ($t(245) = 5.10$, $p < .000$, $d = .65$). Naturally, the negative change scores in the positive condition were reversed, so that the magnitude of change could be compared between valence. There was no significant difference in change score between extreme positive and extreme negative initial ratings ($t(211) = 1.25$, $p = .213$, $d = .17$). There was also no significant difference in change score between moderate positive and moderate negative initial ratings ($t(713) = 1.31$, $p = .191$, $d = .10$).

9.5 Discussion

For both positive and negative conditions, moderate initial ratings were most amenable to change after absorbing new conflicting information. Absolute initial

responses were the least amenable to modification by new conflicting information in both positive and negative conditions; although in the positive condition, this rigidity was not significantly different from extreme initial responses. Although we had hypothesized that absolute responses would be the most rigid, this is nevertheless a paradox. It seems that the new conflicting information, has the least impact, where there is the greatest discrepancy between it and the initial rating. That is, the very responses that have the greatest reason to change, changed the least. This does not simply apply to absolute initial responses, as we had suspected, but also to extreme initial responses. While overall, extreme responses were less rigid than absolute responses, they were more rigid than moderate responses. This suggests that the rigidity we are highlighting is not categorical, but has at least some continuous quality. Our findings also show a marked difference between positive and negative valence conditions. Specifically, negative absolute responses are significantly more rigid than positive absolute responses (or indeed anything else). This is perhaps more surprising, given that the positive conflicting information provided in the negative conditions was reliably true; whereas the negative conflicting information in positive conditions, was mostly just gossip.

9.5.1 Limitations and future directions

Our sample is disproportionately young and female, it would be interesting to see if such an effect could be replicated more generally, in other demographics. Moreover, our data examines rigidity in the subjective appraisal of others (celebrities). Future work could examine a similar effect in other social domains (e.g. political opinions or personal values etc.).

Chapter 10: General Discussion

10.1 Aims

This thesis aimed to address 5 questions outlined in the introduction:

1. To establish a distinction, empirically and theoretically, between the concepts of 'absolute' and 'extreme'.
2. Establishing an ecologically valid method for measuring absolutism.
3. Investigating the relationship between absolutist thinking and wellbeing.
4. Comparing the relative impact of absolutist thinking and negative thinking to wellbeing.
5. Empirically demonstrating a link between absolutist thinking and cognitive rigidity

10.2 The distinction between 'absolute' and 'extreme'

Superficially, the distinction between the concepts of 'absolute' and 'extreme' seem trivial or even arcane. However, as we will argue here, there are very consequential differences between these two concepts, that are both qualitative and quantitative.

An 'absolute', describes a state of totality, either of magnitude or probability. They are free from nuance, provisos and limitations. Conversely, an 'extreme', describes a state of extremity (not totality), of either magnitude or probability. They are not free from nuance, provisos or limitations. Extreme thinking, relates to beliefs or thoughts that deviate greatly from accepted norms, the more they deviate, the more extreme they are. An extreme therefore exists on a continuum, where

something can be more or less extreme. Absolutes on the other hand, are like the proverbial pregnant women, they either are or are not. Interestingly, absolutes need not deviate from the accepted norm, that is, they need not be extreme. For example, a belief that '*there is never a good Nazi*', is absolutist but not extreme. As described in the introduction, absolutes typically manifest in two forms, categorical imperatives and dichotomous thinking. Absolutist thinking, by virtue of its very simplicity, functions as a heuristic that reduces cognitive load. For example, a belief that '*all men are bachelors*' will simplify the issue of male bachelorhood. There will be no need to consider whether or not any given man is a bachelor, because 'all men are bachelors'. Extreme thoughts are not simple, because they crucially retain some nuance and do not describe a state of totality. The belief that '*most men are bachelors*' leaves open the question of whether any given man is a bachelor. This means that extreme beliefs are more cognitively taxing than absolutes, naturally therefore there will be a great incentive to convert extreme beliefs into absolutes. This will reduce cognitive load and is consistent with the cognitive miser hypothesis (Fiske and Taylor, 1983).

As reviewed in chapter 1, the terms absolute and extreme are currently used interchangeably in the literature (e.g. Marin, Gamba & Marin, 1992; Bachman & O'malley, 2010; Clarke, 2000; Peterson et al., 2007). No attempt is made to differentiate between these concepts. As an example, Teasdale et al. (2001) referred to choosing 2 or 6 on a 7-point Likert scale as 'next to extreme' responses. This shows how researchers view absolute end-points as 'extreme', and everything else as 'next to extreme'. In the clinical literature, there is also no attempt at defining absolute thinking as a separate concept to extreme thinking, and the terms are regularly used interchangeably (e.g. "Recognising Cognitive Distortions", 2015)

Overall, the differences between absolute and extreme are not recognised by the empirical and clinical literature. This may be because although absolutes need not be extreme, they often are, since they usually greatly deviate from accepted norms. Note that while absolutist beliefs can be extreme, extreme beliefs are not absolute. Given the substantial and consequential differences between absolutes and extremes, we propose that the terms should be used more carefully to avoid confounding separate concepts.

In chapter two, we constructed and validated a 19-word absolutist dictionary. We had compiled a list of 66 words, and we believed that 22 were absolute, 21 were extreme and the remainder were moderate. Five independent expert judges (2 clinical psychologists and 3 linguists) from the University of Reading were asked to label the words as either 'absolute', 'extreme' or 'moderate'. Judges were permitted to place words into more than one category (i.e. extreme and absolute). The agreement between our original categorization of absolutist words and that of the judges ranged between 83-94%, while the inter-judge agreement was 96%. We found that only 25% of absolutist words were also deemed extreme by some of the independent expert judges and none of the words we had categorized as extreme were deemed absolutist. Crucially, judges showed almost no agreement on extreme words, except for the word 'huge' which was deemed extreme by 3 out of the 5 judges. This demonstrates that independent expert judges clearly distinguished between absolute and extreme words, recognizing them as separate concepts. Moreover, we found that while there was a high degree of agreement on absolute words, there was no agreement for extreme words. This may be because absolutist words have a categorical nature, thereby removing subjectivity from the judgement

process. Extreme words on the other hand exist on a continuum, therefore what may appear extreme to one judge is not deemed so by another. To confirm the distinction between absolute and extreme words we conducted a factor analysis on the combined list of 65 absolutist and non-absolutist words. We found that the highest loading words on the first factor were all absolutist except for '*really*' (which is an adverbial intensifier) and '*anything*' which we had originally categorized as absolutist but due to lack of independent expert validation, was moved to the non-absolutist dictionary. The highest loading words on factor 2 were all non-absolutist except for the absolutist word '*definitely*'. Other than '*definitely*', no absolutist word loaded outside of factor one. As with the independent expert judges, the factor analysis was also not able to separate 'extreme words' from non-absolutist words.

In our first behavioral study in Chapter 7, participants were presented with various ambiguous situations, accompanied by an absolute positive and extreme positive self-talk statement. They were asked to select which of the statements they most prefer for each of the situations shown. We found that participants selected extreme positive statements over absolute positive statements 73% of the time. Once again this marks a clear distinction between these two concepts and identifies extreme positivity as preferable to absolute positivity. This distinction is supported by the psychophysiological data where absolute positive conditions had significantly lower amplitude ($p = .047$), greater latency ($p = .049$) and greater dispersion ($p = .003$) than extreme positive conditions. We have therefore begun to find both subjective and physiological differences in participant responding to absolute and extreme statements. While sweeping conclusions should not be made on the basis of early

psychophysiology work; we believe the subjective judgement differences are now beyond doubt.

10.3 An ecologically valid method for measuring absolutism

The present research aimed to develop a method for calculating absolutist thinking, with high ecological validity, which can be applied to real world data, and recognizes implicit markers often missed by human raters. Prior to this research, absolutism or (extreme responding as it is often termed) was estimated using either Likert type scales, subjective measures questionnaires or independent raters judging semi-structured responses. These methods cannot be applied to observational data, they lack ecological validity, and do not recognize many implicit markers often missed by human raters.

Absolute responding on Likert scales is determined by the number of end-point selections (e.g. 1 or 7, on a 7-point scale). A propensity for absolute responding of this kind, has been linked to certain cultures (e.g. Johnson et al., 2005), lower IQ (e.g. Meisenberg and Williams, 2008), personality disorders (Hamilton, 1968) and multiple mental health conditions (Teasdale et al., 2001). However, the inferences made from absolute responding on Likert type scales are limited by the lack of ecological validity in this method. A number of studies have flagged up methodological problems, for example, effects often depend on the size of the scale used (e.g. Clarke, 2000; Hui & Triandis, 1989). Crucially, there is currently no evidence that findings generalize beyond Likert scales. That is, it is not clear whether the absolute responding on Likert scales of some groups relates to meaningful differences in absolutist thinking, rather than being simply an experimental artefact specific to using Likert scales. Given the

incendiary nature of some of the qualities linked to absolute responding, it is worthwhile corroborating these findings using a more ecologically valid method.

Moreover, absolute responding on Likert scales does not take into account the interference caused by item content. With respect to this point, Berg and Rapaport (1954) developed the 'Questionnaire without Questions' (QwQ); a content-less questionnaire designed to measure response tendency without interference from item content. Individuals are asked to choose between various answers, purely based on the presentation of the options. It is believed that healthy individuals will avoid extreme responses. While the QwQ removes the confounding interference from item content, it does not make the estimate of absolutism any more ecologically valid, and this perhaps is the main limitation.

After an extensive search of the literature, the questionnaire which most closely measures the construct of absolutist thinking is the 'Dichotomous thinking inventory' (DTI; Oshio, 2009) which assesses "black and white cognitive thinking style". It examines three aspects of absolutist thinking, preference for dichotomy, dichotomous beliefs and profit and loss thinking. High scores on the DTI have been linked to borderline personality disorder, narcissism, low self-esteem, undervaluing others, intolerance for ambiguity, perfectionism and correlated with cluster A, B and C personality disorders. Like many subjective measures instruments, the structured response format of the DTI lacks ecological validity. It also requires that participants are explicitly aware of their dichotomous thinking styles, given that cognitive styles and biases are very often unconscious (Watkins, Vache, Verney & Mathews, 1996), this limits the utility of subjective measures questionnaires in this area. Moreover, it only examines dichotomous thinking, not categorical imperatives.

Absolute responding on Likert scales and subjective measures questionnaires are both structured response formats. Arntz and Veen (2000), conducted studies examining a concept related to absolutism, using semi-unstructured response formats. They asked participants with BPD to write down their opinions about characters in film clips. These narratives were then judged by independent raters for complexity. The narratives of BPD participants were judged to have lower complexity and more polarized affect. The semi-structured response format has more ecological validity than the structured response format studies, however, participants are still restricted to commenting on characters in film clips. This cannot be applied to observational data; and human raters are fallible in their judgements, they are liable to miss implicit signs.

Calculating the percentage prevalence of absolutist words through text analysis is the most ecologically valid method for measuring absolutism to date. This method can be applied to in-lab as well as to observational data, and is able to recognize implicit markers which are often missed by human raters. We have shown in chapter 2, that the percentage prevalence of absolutist words specifically relates to absolutist thinking (elevated in BPD and ED forums) as it was not elevated in a wide range of controls. Importantly, absolutist words are functional and functional words are liable to be overlooked.

In chapter 5, we examine the convergent validity between our absolutist dictionary and absolute responding on Likert scales. We find that elevated use of absolute words does correlate with selecting end-points on scales for tourist destinations, films and products. Interestingly, we found a significant drop in absolutist words outside the end-points, although there was a trend towards greater

absolutism as you moved further from the center of the scale. Chapter 5, also identified moderate words, those elevated in non-endpoint selections compared to end-point selections. The prevalence rates of these words can be considered alongside those of absolutist words to refine the measure.

This natural language text analysis method for measuring absolutism relies on unigrams (single words), listed in the 19-word absolutist dictionary (see chapter 2). Some might argue that because words are used in context, unigrams cannot be relied upon to convey absolutism without the surrounding context being considered. In our research we have considered a limited amount of the surrounding context, by compiling a list of absolutist false positives (e.g. “not always”, “hello everyone”). These bigrams (two-words) remove false positives by taking into account the immediate context. Automated text analysis struggles to match more than 2-3 words as there are too many possible combinations. While a qualitative analysis of text is not possible, the advantage of automation is that enormous data sets can be examined and machine learning classifiers can be instituted to automatically classify text samples.

Counting absolutist unigrams without considering the full context in which those words appear is justified by the functional nature of the absolutist words. Function words have no semantic meaning and relate to the structural/process aspect of natural language, not its content. As they are independent of content, it is less important to consider the context in which they appear. Nevertheless, future work could examine whether absolutist words used in certain contexts are more detrimental to mental health. For example, using absolutist words in reference to self

may have different emotional consequences compared to using absolutist words with reference to others.

Our approach mirrors that of clinical practice, where therapists will instruct patients to avoid using absolutist words without specifying a context in which these words should be avoided. The underlying belief is that they are best avoided in all circumstances and non-absolutist alternatives should be used (Williams & Garland, 2002).

In chapter 4, we see how ecological validity is crucial to the accuracy and construct validity of the text analysis method. We sought to establish whether individuals in a clinically depressed sample would use more absolutist words when completing the Ambiguous Scenarios Test for depression (AST-D; Berna et al., 2011). Participants were asked to write descriptions of imagined outcomes for 20 different situations in a couple of sentences. This study would have replicated findings from chapters 2 and 3, where members in affective disorder forums used more absolutist words than members in control forums; however, we failed to replicate the effect. Replication with in-lab clinical and community samples failed for two principal reasons. Firstly, participants were not able to express their thoughts and feelings freely in their responses as they were obliged to answer specific questions. When natural language is constrained in this manner, linguistic markers of interest may be compromised. This is because participants give narrow and formulaic answers which do not allow for more expressive linguistic markers. Secondly, the text samples collected were too small. For each question, participants typically responded with only one or two sentences (30-50 words). This is not an adequate text sample for measuring low frequency words like absolutist words, which have a 1-2% prevalence

rate. We have found that to measure absolutism in the thoughts and feelings of an individual; over 1000 words of unconstrained natural language is required.

10.4 Absolutism and Wellbeing

In chapter two, we demonstrate the ways in which absolutist thinking are linked to affective disorder. We find that the natural language of those with anxiety and depression contains more absolutist words than a range of control groups. Absolutist words also increase with the severity of affective disorder, this is shown in the significantly greater prevalence of absolutist words in suicidal ideation forums compared to anxiety and depression forums. We begin to show that this relationship is not merely correlational, elevated use of absolutist words in recovery forums suggests that absolutist thinking may be a cognitive vulnerability factor for depression. In chapter three we also find that this phenomenon is not specific to the English language or English-speaking cultures, but is also present in at least German, French, Russian and Spanish.

The connection between absolutist thinking with anxiety and depression was largely predicated based on clinical observations and anecdotal evidence. There has been very little empirical work specifically examining this relationship. Empirical studies often investigate the impact of CBT or MBCT in general, rather than one component of the treatments in particular. Consequently, it is difficult to determine the efficacy of any given component of CBT. It is worth ascertaining which aspects of CBT are more effective than others, this will allow practitioners to focus on the most effective practices. Currently, the degree to which absolutist thinking, or indeed any of the cognitive distortions, are addressed depends on the preferences of any given

therapist. It is worth reiterating that almost all of the research examining absolutist thinking in relation to anxiety and depression comes from studies into the efficacy of cognitive therapies, and not of absolutist thinking specifically.

While absolutist thinking is itself a recognized cognitive distortion; we endorse the argument made by REBT, which states that absolutist thinking (what they term demandingness) underlies many, if not all, of the other cognitive distortions. That is, distortions like 'overgeneralizing', 'jumping to conclusions', 'always being right', 'catastrophizing', 'should statements' and many others, cease to be pathological if they were in a non-absolutist form. Indeed, their non-absolutist form, to one degree or another, is a part of any healthy individuals thinking. We argue, along with REBT, that they only become pathological when they take on an absolutist or dogmatic nature.

The causes of affective disorders can be divided into two categories, a process category and a content category. Absolutist thinking (and other cognitive distortions) addresses the process category while the theories on negativity and a negative bias address the content category. There has been surprisingly little debate contrasting these two perspectives of the problem, largely because CBT combines them and is studied holistically, without examining separate components. If the underlying causes of depression are related to process, then therapy should focus on that and not interfere with the content of what people think (e.g. negative bias). There is a second practical implication aside from the nature of the treatment. Process level interventions are more generalizable than content based interventions, because they apply to all content. For example, a person who has problems at work, will benefit little from treatment targeted at love life issues, and vice versa. Whereas disputing

absolutist thinking would be of benefit at work, home or anywhere else. The greater generalizability, also means that process level interventions could be delivered more easily, making use of online methods for instance.

Interestingly, in chapter 2-3 we highlight that absolutist words were better markers for the natural language of affective disorder than pronouns, negative emotions, or indeed any other linguistic dimension. They outperformed the content-laden negative emotion words because they distinguished suicidal ideation from depression forums, while negative emotion words were paradoxically less prevalent in suicidal ideation forums. This once again demonstrates the capricious nature of the content dimension in comparison with the functional absolutist words.

In chapter 2, we show that an elevated use of absolutist words is specific to affective disorder and absolutist thinking, and that it is not simply a reflection of psychological distress. Absolutism may not necessarily be present in mental health conditions which are caused by a specific event or topic. We find that there was no elevation in absolutist words for cancer, PTSD and schizophrenia forums. This may be because the distress caused by cancer, PTSD and schizophrenia has a known specific cause, namely, having cancer, PTSD or schizophrenia. One does not have to be absolutist, or even disposed to affective disorder, to experience feelings of anxiety or depression about a brain tumour, a traumatic event, or hallucinations. In contrast, many anxiety and depression disorders often have multiple vague or even unknown causes. Predisposed individuals are pushed into anxiety and depression by circumstances which by necessity would not have the same effect in the general population.

Because our chapter 2 study had large samples from multiple sources, and a

naturalistic observational design, it consequently had low experimental control. We could only infer general demographic characteristics from different forums (e.g. women post on Mumsnet and young people post on Student Room etc.). The identities and motivation of users was largely unknowable. We did check that the authors of posts were at least purporting to be a representative of the relevant online community, but we had no power to go beyond this basic check. Follow-up studies could use an experimental study design, and perhaps alternative methodologies, to replicate and extend the findings initially presented here. We have been contacted by other labs who have expressed an interest in replicating our findings using our absolutist dictionary on natural language data collected in their labs from clinically diagnosed patients. This is clearly a welcome extension of our work and we look forward to the findings produced from others using our absolutist dictionary.

We have not addressed within-person variation in absolutist thinking and how that relates to changes in affective symptoms at an individual level (c.f. Molenaar and Campbell, 2009). For example, are individual changes in suicidal ideation over time reflected in changes in use of absolutist words? Future research could also seek to track absolutist thinking (and affective disorder) in individuals over time. This could have even greater utility for clinical practice.

Future intervention studies could examine the causal status of absolutist thinking further, one possibility would be to use a cognitive bias modification paradigm (Hallion & Ruscio, 2011). The aim would be to introduce some manipulation of absolutist thinking in participants and then examine the subsequent effects. Alternatively, a narrow form of CBT which focussed on targeting absolutist thinking could be clinically trialled.

10.5 Absolutism and Negativity

Humans are already disposed to attending to content, and negativity is a ubiquitous feature in those with depression. Given this, the belief that negativity may play a causal role in depression was almost inevitable. Many studies often present correlational data and the causation is simply implied or generally assumed to be supported. Interpretive bias training, or cognitive bias modification (CBM), is an intervention which seeks to demonstrate the causal role for the negativity bias in depression.

CBM aims to modify cognitive biases, by which they mean the negative bias. There are now a variety of CBM strategies for modifying negative attentional bias and negative interpretive bias. For the attentional bias, a version of the dot probe task is often used, and participants are instructed to attend to positive stimuli. For the interpretive bias, participants are presented with a series of ambiguous incomplete statements, participants are asked to complete the statement in a way that disambiguates the valence in a positive direction. Alternatively, participants are asked to repeatedly select 'good' or positive images, faces and scenarios.

There have been many studies examining the efficacy of CBM treatment and their findings have been mixed. In a recent meta-analysis, Cristea, Kok and Cuijpers (2015) reviewed 49 randomized control studies for depression and anxiety. Their meta-analysis accounted for outliers, the quality of the publishing journal and considered both clinical and subclinical levels of depression and anxiety. They employed funnel plots to account for publication bias, finding an asymmetrical distribution around the mean effect size. An unbiased sample should have the more

precise estimates clustered around the mean and less precise measurements distributed evenly further out. This meta-analysis concluded that "for clinical samples, the effects of CBM interventions on anxiety and depression outcomes were small and in most cases non-significant; in the cases where they were significant, such as for depression, it seems to have been as a result of the presence of outliers and/or publication bias". They highlight that for many studies CBM was not accomplished, as participants biases were not modified by the intervention. In an earlier meta-analysis, Hallion and Ruscio (2011) included 45 studies (2,591 participants) and found similar results. The conclude that CBM had a small effect on anxiety and depression, the effect was only reliable when symptoms were assessed with a stressor. When anxiety and depression were examined separately, CBM significantly modified anxiety but not depression. Overall, these meta-analyses cast serious doubt on the casual nature of negative thinking in depression and anxiety.

In Grafton et al., (2017), the proponents of CBM have responded to these findings. They note that where the CBM intervention fails to bring about bias modification, this cannot be considered CBM. They separate studies into those where negative bias modification was achieved and those where it was not. They find, that where bias modification actually occurs, the effect sizes for depression and anxiety reduction are more robust. Fundamentally, they argue that negativity plays a causal role in depression, because where negativity can be shown to be reduced (not merely attempted), there is a reduced susceptibility to depression after a stressor. There is however a flaw in this reasoning. They select only studies where negativity is reduced (for whatever reason) and find that those participants are correspondingly less vulnerable to depression. They then conclude that it is specifically the reduction in

negativity that has reduced the vulnerability. However, if negativity was a symptom, not a cause of depression, then the same pattern of results would be seen where participants vulnerability improved for other reasons. Consider a sports injury that produces pain, if you select only the patients whose pain has reduced (for whatever reason) after a given period of time and find that those patients are more like to have healed their injury, you cannot conclude that pain reduction heals injuries.

If negativity does not play a causal role in depression, and if absolutism can be applied to negative as well as positive content, what then explains the ubiquitous presence of negative thinking in those with depression? If it is merely a symptom of depression, why does depression manifest this particular symptom?

To recognize why negativity would be an inevitable byproduct of absolutist thinking we first have to introduce the self-discrepancy theory of Higgins (1987, Figure 10.1) and the self-regulation theory of Carver and Scheier (2001, Figure 10.1). Higgins (1987), argued that individuals compare their 'actual' selves to either their 'ideal' self or 'ought' self. The discrepancy between the actual self and these internalized standards produces various emotions, depending on the nature of the comparison. These emotions could be embarrassment, disappointment, anger, humiliation, sadness or even depression. The emotional discomfort motivates individuals to reduce the discrepancy to their own various internalized standards. In this way, the theory has an evolutionary foundation.

If it was indeed the case, that a discrepancy from our ideal self produces unhappiness; this would mandate that people be unhappy almost all of the time. It is worth repeating this point, if it was indeed the case, that a discrepancy from our ideal self produces unhappiness; this would mandate that people be unhappy almost all of

the time. This is because the vast majority of people are in a near ubiquitous state of deficit with respect to their ideal self. Yet, most healthy individuals do not manifest such perpetual unhappiness, indeed, most people tend to be generally positive. This led Carver and Scheier (2001) to propose a self-regulation theory which refines aspects of Higgins (1987) self-discrepancy theory. They contend, that positive emotions are produced when individuals make satisfactory progress towards desired goals. However, where there is no progress towards goals, or where the progress is too slow, this will produce negative emotions. Therefore, it is not the discrepancy between actual and goal states that produces emotions (as outlined by Higgins), rather, emotions are determined by the rate at which these discrepancies are reduced.

I argue that if you apply absolutist thinking to the self-regulation model outlined by Carver and Scheier, the result will be the persistent negativity implied by the Higgins model. Individuals that view discrepancies in and absolutist way, have a black and white view that makes appreciating gradual improvement (required by Carver and Scheier) more difficult. To appreciate gradual improvement, an individual requires a more nuanced outlook. Similarly, if a desired goal is unachievable, or too difficult to achieve, a non-absolutist individual will have the flexibility to shift to an alternative goal. This will allow them to continue to produce positive emotions on-route to a new goal. Those with an absolutist outlook, are liable to rigidly insist on the original goal and suffer from making little (or no) progress. An absolutist view of a discrepancy, also makes the very discrepancy less tolerable. Overall, an absolutist view of a discrepancy makes it more difficult to appreciate piecemeal progress, less likely to adaptively change goals and a greater intolerance of the discrepancy itself. As noted

from the Higgins (1987) model, discrepancies are ubiquitous, and an inability to deal effectively with them (due to absolutism) will result in a state of unhappiness and negativity.

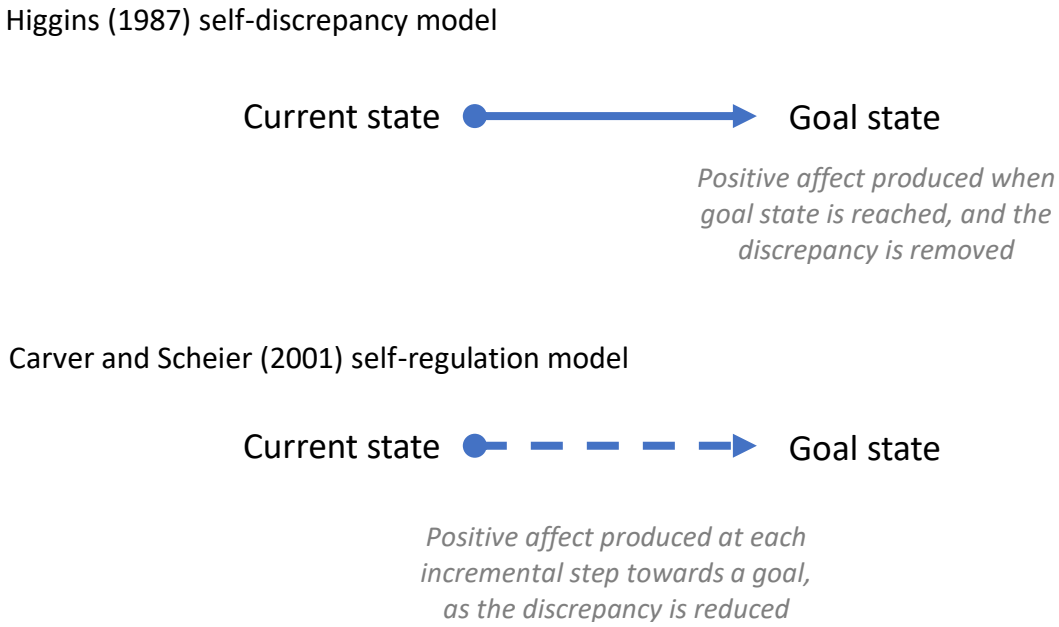

Figure 10.1 Dipiction of the self-dicrepancy (Higgins, 18987) and self-regulation (Carver and Scheier, 2001) models.

In this thesis we began to examine how a community sample felt about absolutist thinking and negative thinking under various conditions. Additionally, we investigated whether those who preferred positive or non-absolutist appraisals, had fewer symptoms of depression. Generally, we found that participants preferred positivity and non-absolutism. When forced to choose, there was a high degree of variation in the sample between those that preferred positivity at the cost of absolutism (absolutely positive appraisals) and others who preferred non-absolutism at the cost of negativity (moderately negative appraisals). There was no correlation

between these preferences and symptoms of depression. This means that those who preferred positivity at the cost of absolutism did not have higher levels of depression symptoms. Similarly, those who preferred non-absolutism at the cost of negativity also did not have higher levels of depression symptoms. Future work in this area should investigate the topic in a more ecologically valid manner. Moreover, our study employed a sample of British university students, mostly female and mostly young. It would be interesting to see how results would differ using samples that are predominantly male, older or from different cultures. It could be hypothesised that eastern cultures, which place a greater emphasis on moderation ("the middle way") and less emphasis on positive thinking (Matthews, 2000; Yamazaki and Kayes, 2010), may select negative non-absolutist statements more than western community samples.

10.6 Absolutism and Cognitive Rigidity

Absolutist thinking (either categorical imperatives or dichotomous thinking) has previously been linked to cognitive rigidity (Teasdale et al., 2001). While there are good intuitive reasons to assume that absolutist thoughts are more cognitively rigid, in this research, we set out to empirically demonstrate the connection. In theory, change is much easier on a continuum as the gap between one position and the next is relatively small (depending on the scale). Those that have a dichotomous outlook will find change more difficult because changing a dichotomous belief requires adopting its polar opposite. The size of the change required makes it more difficult and less likely to occur. Alternatively, an individual can bring about change by abandoning the dichotomous perspective and instituting a more nuanced outlook, but

this also requires more effort. It is simply easiest for those that already have a non-absolute perspective to change their beliefs.

We found that this was indeed the case, appraisals of well-known celebrities that were absolute, were correspondingly more rigid. The responses were recorded on analog scales for both positively and negatively valenced celebrities. It should be noted that the absolute appraisals had the most reason to change as they had the largest discrepancy with the new information presented. Once again our sample was disproportionately young and female, it would be interesting to see if such an effect could be replicated more generally, in other demographics. Moreover, our data examines rigidity in the subjective appraisal of others (celebrities). Future work could examine a similar effect in other social domains (e.g. political opinions or personal values etc.).

10.7 Limitations and Future directions

The research presented here was intentionally limited to only five aims; (1) establishing a distinction between 'absolute' and 'extreme'; (2) pioneering an ecologically valid method for measuring absolutism; (3) investigating the relationship between absolutism and wellbeing; (4) comparing absolutism with negativity in relation to their impact on wellbeing; and finally (5) empirically demonstrating that absolute beliefs are more cognitively rigid. All but the first aim would benefit from yet more research.

Our absolutist dictionary, which is used to calculate the percentage prevalence of absolutism in natural language, could be expanded and/or refined, based on greater validation of absolutist words. Moreover, in the observational study outlined

in chapter 2, there was very little experimental control. We could only infer general demographic characteristics about users based on the forums they wrote on. Their identities, motivations, clinical status etc., is largely unknowable. Follow-up studies should take a more experimental design; perhaps setting up a controlled 'mock' internet forum, where known participants (for whom there are descriptive statistics and diagnoses) could post in a similar fashion to public internet forums. An additional advantage in such an experimental design is that experimenters could track a given individual over time, perhaps months. They would have a record of both traditional subjective measures, and their natural language text analysis statistics, which they could examine for correlations over time. In chapter 2, we also suggested, based on tentative empirical data, that absolutist thinking may be a cognitive vulnerability for depression, anxiety and suicidal ideation. To examine this further, future studies would need to develop an intervention for disputing absolutist thinking specifically in those with certain mental health disorders, and then demonstrate that their intervention reduces vulnerability after exposure to a stressor. This could be an adapted version of the cognitive bias modification exercises used to remove negative thinking biases.

In determining the convergent validity for the measurement of absolutism in natural language with that for absolute responding on Likert scales, we examined the natural language in various online review websites (TripAdvisor, IMDB and Amazon). Future studies should seek to examine absolute responding on Likert scales for more personal beliefs with the absolutist word prevalence in natural language about those same personal beliefs. In addition, future research could work to develop a subjective

measures absolutist thinking scale. There is currently only one such scale (Oshio, 2009) which examines the related topic of dichotomous thinking.

In chapter 7-8, we conducted a series of behavioral studies to examine whether participants preferred moderate negative statements or absolute positive statements. We found that participants preferred absolute positive statements more when they were primed to focus on themselves. This study was conducted using a sample of psychology student at the University of Reading. The sample was overwhelmingly young and female, there may well be differences in response for different demographics, therefore any replication study should recruit a broader sample. We had predicted but did not find, that those placed under a time pressure would also select more absolute positive statements as it is the more superficially positive option. Future studies may want to replicate this attempt, by instituting a better time pressure manipulation. We also predicted but found no relationship between a preference for absolute positive statements and depression. It may be that examining the connection between depression with absolutism and valence simultaneously, leads to inevitable confounds that obscure the results.

In chapter 9, we begin to demonstrate empirically that absolute beliefs are more cognitively rigid. As with our behavioral work, this study had a narrow sample of predominantly young and female psychology student at the University of Reading. Future research should aim to broaden this to include a more representative sample of the population. Secondly, we focused on obtaining absolute/non-absolute beliefs about well-known celebrities. To make this research more relevant to those with depression and other mental health disorders, future work should focus on capturing absolute beliefs relevant to mental health. Finally, future studies examining the

cognitive rigidity associated with absolutism may also seek to be more ecologically valid than that outlines in chapter 9.

To make the scope of the research manageable, we set out 5 specific questions to address in this thesis. This however is only a small fraction of what could be studied and understood with respect to absolutism more generally. More work needs to be done establishing the mechanism by which absolutist thinking brings about various mental health disorders. In this discussion, we have laid out the theory (self-discrepancy/regulation theory), but collecting empirical data to support this theory is beyond the scope of the present thesis. While have presented data linking absolutist thinking with some mental health conditions, more work needs to be done detailing which conditions are and are not related to absolutist thinking (e.g. addiction, obsessive compulsive-disorder, phobias etc.). These could also be subclinical general unhappiness and lack of thriving or more serious personality disorders. The impact of absolutist thinking also extends beyond mental health, the concept of absolutist pervades throughout politics, religion, society and culture. The methodologies, and even some of the insights, derived from mental health research focused on absolutism could be beneficial to these other fields (and vice versa).

Finally, there have been a great number of studies examining various forms for reappraisal using functional magnetic resonance imaging (fMRI). These have often centered on positive reappraisal, where participants are asked to appraise a given ambiguous situation in a more positive way. It would be quite simple to adapt these same paradigms to conduct cognitive reappraisal studies targeted at disputing absolutism and instructing participants to appraise a stimulus in a non-absolute way, while in the fMRI scanner. This would highlight regions in the brain which are

important in moving away from the heuristic of absolutist thinking and towards a more nuanced and sophisticated non-absolutist perspective.

10.8 Conclusion

This research set out to address five questions laid out in the introduction. In addressing these questions, we have (1) established that the concept of absolutism is theoretically and empirical distinct from extremism. This qualitative and quantitative difference has consequential implications in specifying the type of cognitive distortion that correlates and begets anxiety, depression and suicidal ideation. We have (2) developed a new method for measuring absolutist thinking, using text analysis and natural language. This method is drastically more ecologically valid then the few previous attempts at estimating this construct. Moreover, we have established convergent validity between our method of measuring absolutist thinking in natural language and the more traditional method of counting absolute responses on Likert scales. We find (3) strong correlations between absolutist thinking and a range of affective disorders. We show that an elevated use of absolutist words is a marker for absolutist thinking and not psychological distress per se. Also, we present data that suggests absolutist thinking is a cognitive vulnerability for depression and suicidal ideation, not merely a correlate. We show (4) that absolutism is a better marker for the natural language of affective disorder than negativity. Moreover, we present behavioral data that reveals most individuals prefer moderate negativity over absolute positivity, although this is liable to manipulation when priming people to focus on themselves as opposed to others. Finally (5), we empirically demonstrate that

absolute thoughts are more cognitively rigid than non-absolute thoughts, even when they have more reason to be changed.

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Appendix

Appendix 1

SPSS SYNTAX

```
BOOTSTRAP
  /SAMPLING METHOD=STRATIFIED(STRATA=Forum )
  /VARIABLES TARGET=AbsolutistLog10 INPUT=Condition Forum  WC
  /CRITERIA CILEVEL=95 CITYPE=BCA  NSAMPLES=1000
  /MISSING USERMISSING=EXCLUDE.
MIXED AbsolutistLog10 BY Forum Condition
  /CRITERIA=CIN(95) MXITER(150) MXSTEP(10) SCORING(1)
SINGULAR(0.000000000001) HCONVERGE(0,
    ABSOLUTE) LCONVERGE(0, ABSOLUTE) PCONVERGE(0.000001, ABSOLUTE)
  /FIXED=Condition | SSTYPE(3)
  /METHOD=REML
  /REGWGT=WC
  /PRINT=  SOLUTION TESTCOV
  /RANDOM=Forum(Condition) | SUBJECT(Forum) COVTYPE(VC).
```

Appendix 2

In-House Text Analysis Python Code

In house Python Script for Word Level Analysis:

```
# script to assess absolutism/reletivism

from __future__ import division
import nltk
import nltk, re, pprint
import numpy
import matplotlib
import re
import xlsxwriter
import string
import codecs
from nltk.stem.porter import PorterStemmer
porter_stemmer = PorterStemmer()

workbook = xlsxwriter.Workbook('absolutist001.xlsx') #creating a workbook
worksheet = workbook.add_worksheet() #creating a worksheet
number_list = []

file = open('absol19.txt') # This is the dictionary in use - change as appropriate
t = file.read(); #reading file
t.lower() # Normalising
u_t = unicode(t, errors='ignore') #converting string into Unicode
absol = nltk.word_tokenize(u_t) #tokenize the 'string' -> absol
```

```
text = nltk.Text(absol) #converts to nltk?
sorted(set(absol)) #sorts into alphabetical order and removes repeats
file = open('suic.txt') #This is the file you want to test
raw = file.read(); #Reading above text
u_raw = unicode(raw, errors='ignore') #Converting to Unicode
u_raw.lower() #Normalising
Ellis = nltk.word_tokenize(u_raw) #Tokenising text
text = nltk.Text(Ellis) #converts to nltk

for item in absol: #for each item in absol list
    fdist = nltk.FreqDist(Ellis) #calculates frequency distribution for all words in
Ellis
    numbers = str(fdist.freq(item)) #Convert dictionary item frequencies to string
format
    re.split(r'\s+', numbers) # convert frequency string to list
    number_list.append(numbers) #add those numbers to a numbers list

row = 0
col = 0
for item in number_list:
    worksheet.write(row, col,     item)
    row += 1

worksheet.write(row, 1, 'Total')
worksheet.write(row, 0, '=SUM(A1:A431)')

workbook.close()
#below code prints out concordance
def get_all_phrases_containing_tar_wrd(target_word, tar_passage, left_margin
= 10, right_margin = 10):
    Ellis = nltk.word_tokenize(tar_passage)
    text = nltk.Text(Ellis)
    c = nltk.ConcordanceIndex(text.Ellis, key = lambda s: s.lower())
    concordance_txt = ([text.Ellis[map(lambda x: x-5 if (x-left_margin)&gt[0] else
0, [offset])[0]:offset+right_margin]
                        for offset in c.offsets(target_word)])
    return [''.join([x+' ' for x in con_sub]) for con_sub in concordance_txt]

Ellis = nltk.word_tokenize(u_raw)# This section prints out only matched words
ci = nltk.ConcordanceIndex(Ellis)
for t_word in absol:
    if ci.offsets(t_word):
        ci.print_concordance(t_word)
print
print 'Results from function'
results = get_all_phrases_containing_tar_wrd(absol, u_raw)
for result in results:
```

Appendix 3

Table S1. Characteristics of Test and Control Internet Forums.

		Category	Forum source	Word Count[b]	No. of posts[c]	Avg. post length[d]
Study 1	Control Groups	General Forums[a]	Mumsnet.com	36617	157	210
			Boards.ie/TheLadiesLounge	31420	131	221
			Boards.ie/TheGentlemensClub	26419	121	173
			Askmen.com	37222	141	258
			PensionersForum.co.uk	30102	126	154
			TheStudentRoom.co.uk	31175	142	221
			Boards.ie/WorkandJobs	32254	109	258
		Asthma Forums	HealthUnlocked.com	33675	122	272
			Patient.info/Asthma	19010	95	211
			Dailystrength.org	34627	90	253
			Healthboards.com	32500	111	248
		Diabetes Forums	Diabetes.co.uk	34963	152	211
			Patient.info/Diabetes	32885	139	267
			Diabetessupport.co.uk	38347	174	198
			Diabetes-support.org.uk	31453	122	242
		Cancer Forums	Beatingbowelcancer.org	35940	95	259
			Macmillan.org.uk	33042	141	203
			Cancerforums.net	33007	122	225
			ProstateCancerUK.org	33438	93	241
	Test Groups	General Anxiety Disorder Forums	Patient.info/Anxiety	42078	152	240
			Anxietyforum.net	38962	85	371
			Anxietyzone.com	43817	115	332
			Nomorepanic.co.uk	32723	90	266
			Mentalhealthforum.net	36387	96	334
			Psychforums.com	35432	76	449
		Depression Forums	Patient.info/Depression	34616	103	304
			Mentalhealthforum.net	33167	69	357
			Depressionforums.org	36504	83	341
			Dealingwithdepression.co.uk	30465	65	317
			Psychcentral.com/Depression	40147	107	309
			Beyondblue.org.au	35586	127	256
		Suicidal Ideation Forums	Suicideforum.com	42339	112	359
			Takethislife.com	43611	98	383
			Suicidemethods.net	39447	104	355
			Experienceproject.com	38542	59	290
Study 2	Control Group	Post Traumatic Stress Disorder Forums	Myptsd.com	40511	112	362
			Psychforums.com/PTSD	38577	90	433
			Psychcentral.com/PTSD	34852	88	387
			Patient.info/PTSD	20659	42	492
			Mentalhealthforum.net	40435	96	400
			Ehealthforum.com	34731	107	302
		Schizophrenia Forums	Psychforums.com	38924	77	512
			Schizophrenia.com	33460	106	216
			Mentalhealthforum.net	32687	104	314
			Psychcentral.com	40187	137	277
			eHealthforum.com	36745	75	477
			Healthboards.com	31430	94	314
	Test Group	Borderline Personality Disorder Forums	Psychforums.com	35472	98	362
			Mentalhealthforum.net	33589	86	377
			Psychcentral.com	32717	100	312
			Experienceproject.com	15058	42	350
		Eating Disorder Forums	Patient.info/Eating-disorders	37018	134	270
			Nationaleatingdisorders.org	35733	126	267
			Mentalhealthforum.net	33433	117	283
			Psychcentral.com	12379	44	281
			Recoveryourlife.com	34152	126	269
Study 3	Test Group	Recovery Forums	Depressionforums.org	45054	112	302
			Psychcentral.com	13612	25	378
			Dealingwithdepression.co.uk	12325	24	342
			Takethislife.com/Success Stories	35061	68	455
			Takethislife.com/GettingBetter	36792	94	287
			Beyondblue.org.au/StayingWell	42731	104	375
			Suicideforum.com/PositiveFeelings	48436	131	327

Note. GAD = Generalized anxiety disorder; PTSD = Post traumatic stress disorder; BPD = Borderline personality disorder; ED = Eating disorder.

[a] General Forums = 'Mumsnet' (Women), 'The Ladies Lounge' (Women), 'The Gentlemen's Club' (Men), 'Ask Men' (Men), 'Pensioners Forum' (Elderly), 'Student Room' (Young), 'Work Problems'.
[b] Word count for each forum, only 'first posts' collected.
[c] Number of 'first posts' which comprise the forums corpus.
[d] Average number of words in each forum post

Appendix 4

Word ratings

Please decide whether the adjacent 66 words are absolute, relative and/or extreme
You may select more than one option

Absolute words are associated with 'black and white thinking'
Absolute words have no nuance

Relative words have some nuance

Extreme words denote a high deviation from a neutral position

Words	Absolute	Relative	Extreme
100%			
about			
absolutely			
all			
almost			
always			
anything			
around			
complete			
completely			
consider			
considered			
considering			
constant			
constantly			
could			
definitely			
doubt			
entire			
especially			
ever			
every			
everyone			
everything			

expect			
extremely			
fair			
fairly			
full			
general			
generally			
huge			
likely			
may			
maybe			
might			
mostly			
must			
nearly			
need			
needed			
never			
normally			
nothing			
often			
perhaps			
possibility			
possible			
possibly			
pretty			
probably			
rather			
really			
relatively			
seriously			
slight			
slightly			
some			
somewhat			
suppose			
thought			
totally			
unsure			
usually			
very			
whole			

Appendix 5

Removing False Positives

not absolute*	441
almost absolute*	441
hi all	441
hello all	441
thanks all	441
not all	441
almost all	441
dear all	441
all in all	441
not always	441
almost always	441
not complete	441
almost complete	441
not completely	441
almost completely	441
not constant	441
almost constant	441
not constantly	441
almost constantly	441
not definite*	441
almost definite*	441
not entire*	441
almost entire*	441
not every	441
almost every	441
every 1	441
every 2	441
every 3	441
every 4	441
every 5	441
every 6	441
every 7	441
every 8	441
every 9	441
every 10	441
every few	441
every two	441
every three	441
every four	441
every five	441
every six	441
every seven	441

every eight	441
every nine	441
every ten	441
not everyone	441
hi everyone	441
hello everyone	441
thanks everyone	441
almost everyone	441
not everything	441
almost everything	441
not full*	441
almost full*	441
full time	441
not never	441
almost never	441
not nothing	441
probably nothing	441
almost nothing	441
not total*	441
almost total*	441
not whole	441
almost whole	441

Appendix 6

RussGen6
http://www.brik.org/forum.php
RussGen5
http://forum.vega-int.ru/
RussGen4
http://mospens.ru/
RussGen3
http://www.studforum.ru/viewforum.php?f=36&sid=a917abf857ebd836154248002ac80f94
RussGen2
http://kiev.com.ua/forum/forumdisplay.php?f=115
RussGen1
http://www.u-mama.ru/forum/
RussDep6
http://www.psygorodok.ru/forum/viewforum.php?f=172
RussDep5
http://neuroleptic.ru/forum/forum/30-%D0%B0%D1%84%D1%84%D0%B5%D0%BA%D1%82%D0%B8%D0%B2%D0%BD % D1% 8B% D0% B5-% D1% 80% D0% B0% D1% 81% 81%% the D1 the D1% 82% 80% the D1% D0% BE% D0% B9% D1% 81% the D1% 82% D0% B2% D0% B0 /
RussDep4

http://www.palata6.net/forum/index.php?s=63cfaaa85b7b4c89e68da1fdd5e70528&showforum=84
RussDep3
https://www.b17.ru/forum/?f=4
RussDep2
http://mneploho.net/forum/thread61.html
RussDep1
http://psycheforum.ru/forum98.html
FrenchGen5
https://www.entrepatients.net/fr/communautes/groupes/asthme
FrenchGen4
http://www.boursorama.com/forum-retraite-1
FrenchGen3
http://forum.doctissimo.fr/viepratique/travail/liste_sujet-1.htm
FrenchGen2
http://forums.studyrama.com/index.php?showforum=18
FrenchGen1
http://forum.magicmaman.com/showthread.php?701564-Presentation_question_APE
FrenchDep5
http://revivre.org/forum/viewforum.php?f=33
FrenchDep4
https://www.entrepatients.net/fr/communautes/groupes/depression
FrenchDep3
http://www.onmeda.fr/forum/d%C3%A9pression-et-mal-%C3%AAtre
FrenchDep2
http://forum.doctissimo.fr/psychologie/depression-deprime-stress/liste_sujet-5.htm
FrenchDep1
http://forum.psychologies.com/psychologiescom/deprime-depression/liste_sujet-1.htm
GermGen6
http://www.beobachter.ch/foren/uebersicht/foren/list_topic/politik/
GermGen5
http://www.beobachter.ch/foren/uebersicht/foren/list_topic/arbeitsforum/
GermGen4
http://www.beobachter.ch/foren/uebersicht/foren/list_topic/gesundheitsforum/
GermGen3
https://www.ihre-vorsorge.de/forum.html
GermGen2
http://www.studentenseite.de/forums/allgemeines-zum-studentenleben.8/
GermGen1
http://www.babyclub.de/mybabyclub/community/foren/11530539.kleinkind-forum.html
GermDep6
http://f3.webmart.de/f.cfm?id=888031&sr=1
GermDep5
https://www.depri.ch/f9/
GermDep3
http://bfriends.brigitte.de/foren/depressionen/
GermDep2

http://www.nur-ruhe.de/smf/index.php?PHPSESSID=g0al9k41jg0dl29la8k8dp78hfo3jmm2c565vq4r4a1d073n9n51&board=12.0
GermDep1
http://www.psychologieforum.de/psychologie-was-menschen-belastet-12/depression-15/
SpanGen5
http://www.mediavida.com/foro/estudios-trabajo
SpanGen3
http://foros.monografias.com/forumdisplay.php/45-Foro-Masculino
SpanGen2
http://www.enfemenino.com/world/communaute/forum/forum0.asp
SpanGen1
https://www.crianzanatural.com/forum/forum_posts.asp?TID=200377
SpanDep6
http://www.forumclinic.org/foros/depresi%C3%B3n
SpanDep4
http://www.foros24h.com/242/depresion/
SpanDep3
http://www.fobiasocial.net/porque-el-antioqueno-es-tan-engreido-80581/
SpanDep1
http://www.psicologia-online.com/foros/viewtopic.php?f=5&t=67486&sid=c4e48f4f990866f8de4d8e96d61526fa

Appendix 7

French Absolutist Dictionary

absolument	402
tout	402
toujours	402
complet	402
complètement	402
constante	402
constamment	402
certainement	402
entière	402
tous	402
tout le monde	402
sans cesse	402
plein	402
doit	402
jamais	402
rien	402
total	402
entier	402
toute	402
tout à fait	402

Appendix 8

German Absolutist Dictionary

absolut	406
alle	406
immer	406
komplett	406
vollständig	406
Konstante	406
ständig	406
bestimmt	406
ganz	406
jemals	406
jeder	406
jedermann	406
alles	406
voll	406
nie	406
nichts	406
völlig	406
ganze	406
stets	406
komplettes	406
völlig	406

konstant	406
definitiv	406
ganzen	406
jeden	406
voller	406
müssen	406
niemals	406
total	406
ganzes	406
ganzer	406
ganze	406
jedem	406
vollen	406
muss	406
jede	406
volle	406

Appendix 9

Russian Absolutist Dictionary

%	
100	405
Абсолютно	405
Все	405
весь	405
Всегда	405
Полностью	405
постоянная	405
Постоянно	405
полный	405
Когда-либо	405
каждый	405
Должен	405
Ничего	405
определенно	405

Appendix 10

Spanish Absolutist Dictionary

100	403
absolutamente	403
todas	403
siempre	403
completamente	403
constante	403
constantemente	403

nunca	403
cada	403
todo	403
completo	403
debe	403
nunca	403
nada	403
totalmente	403
completar	403
seguro	403

Appendix 11

Naive Bayes Machine Learning R Script

```
############ THINGS TO INSTALL #############
############ THINGS TO INSTALL #############
############ THINGS TO INSTALL #############
install.packages("Matrix")
install.packages("quanteda")
install.packages("devtools")
install_github("kbenoit/quantedaData")

devtools::install_github('kbenoit/quantedaData')
install.packages("tm")  # for text mining
install.packages("SnowballC") # for text stemming
install.packages("wordcloud") # word-cloud generator
install.packages("RColorBrewer") # color palettes
install.packages('caret', dependencies = TRUE)
install.packages("readtext")

library("devtools")
library(quanteda)
library(quantedaData)
library(readtext)
library(quanteda)
library(quantedaData)
library("quanteda", quietly = TRUE, warn.conflicts = FALSE)
library(caret)
library("tm")
library("SnowballC")
library("wordcloud")
library("RColorBrewer")
```

```
##### PREPROCESSING AMAZON DATA ############
##### PREPROCESSING AMAZON DATA ############
##### PREPROCESSING AMAZON DATA ############


AbsolDict <- dictionary(list(absolutes = c("absolutely", "absolute", "all", "always", "complete",
                        "completely", "constant", "constantly",
                        "definitely", "definite", "entire", "entirely", "ever",
                        "everyone", "everything", "full", "fully", "must",
                        "never", "every", "nothing", "totally", "total",
                        "whole")))

require(quanteda)
require(readtext)
Amazonfiles <- readtext("/Users/mohammedalmosaiwi/Documents/Uni/Pythonwork/Valence/Text
Documents_Temp/*.txt")
LIWC_Amazon =
read.csv("/Users/mohammedalmosaiwi/Documents/Uni/Pythonwork/Valence/LIWC_VALENCE2.csv", header =
TRUE)

Amazonfiles["RatingsAbsol"] = (rep(c(1, 1, 2, 2, 2, 2, 2, 2, 2), len = nrow(Amazonfiles)))
Amazonfiles["Group"] = rep(1:3, each = 162, 90, 90, len = nrow(Amazonfiles))
Amazonfiles["Ratings"] = (rep(c(1, 10, 2, 3, 4, 5, 7, 8, 9), len = nrow(Amazonfiles)))
Amazonfiles["Valence"] = (rep(c(1, 2, 1, 1, 1, 3, 2, 2, 2), len = nrow(Amazonfiles)))
Amazonfiles[253:342, 4] = rep(3)
Amazonfiles[163:342, 3] = (rep(c(1, 2, 2, 2, 1), 36))
Amazonfiles[163:342, 5] = (rep(c(1, 2, 3, 4, 5), 36))
Amazonfiles[163:342, 6] = (rep(c(1, 1, 3, 2, 2), 36))

# head(Amazonfiles)
# View(Amazonfiles)

# RENAME headings in data.frame
names(Amazonfiles) <- c("Filename", "text", "RatingsAbsol", "Groups")

# FACTORIZE (ratings), create new binary variable
Amazonfiles$RatingsAbsol <- as.factor(Amazonfiles$RatingsAbsol)
Amazonfiles$Groups <- as.factor(Amazonfiles$Groups)

# MISSING DATA check
length(which(!complete.cases(Amazonfiles)))

# DISTRIBUTION of groups check
prop.table(table(Amazonfiles$RatingsAbsol))
```

```
prop.table(table(Amazonfiles$Groups))

# FORMATTING - convert text to utf8
Amazonfiles$text = iconv(enc2utf8(Amazonfiles$text),sub="byte")

###FIND AND REPLACE within a data frame - cleaning data
Amazonfiles$text = gsub("\n", " ", Amazonfiles$text)
Amazonfiles$text = gsub("/", " ", Amazonfiles$text)
Amazonfiles$text = gsub("&", "and", Amazonfiles$text)

library(caret)
set.seed(32984)
Amazon.indexes <- createDataPartition(Amazonfiles$RatingsAbsol, times = 1,
                                      p = 0.7, list = FALSE)


trainAmazon <- Amazonfiles[Amazon.indexes,]
testAmazon <- Amazonfiles[-Amazon.indexes,]
trainLIWC = LIWC_Amazon[Amazon.indexes,]
testLIWC = LIWC_Amazon[-Amazon.indexes,]

prop.table(table(trainAmazon$RatingsAbsol))
prop.table(table(testAmazon$RatingsAbsol))
prop.table(table(trainAmazon$Groups))
prop.table(table(testAmazon$Groups))

AmazonCorpus <- corpus(trainAmazon)
colnames(trainAmazon)
colnames(testAmazon)
colnames(trainLIWC)
colnames(testLIWC)


# TOKENIZE
trainAmazon.tokens = tokens(trainAmazon$text, what = "word",
                            remove_numbers = TRUE, remove_punct = TRUE,
                            remove_symbols = TRUE, remove_hyphens = TRUE)


# LOWER CASE the tokens.
trainAmazon.tokens = tokens_tolower(trainAmazon.tokens)

# STOP WORDS
trainAmazon.tokens.FUNCTION <- tokens_select(trainAmazon.tokens, AbsolDict)
# STEMMING
trainAmazon.tokens.FUNCTION <- tokens_wordstem(trainAmazon.tokens.FUNCTION, language = "english")
```

```
# DFM <- Preprosessed data
trainAmazon.tokens.dfm <- dfm(trainAmazon.tokens.FUNCTION, tolower = FALSE)
dim(trainAmazon.tokens.dfm)

# LEXICAL DIVERSITY - trainAmazon_LexDiv
trainAmazon.tokens.ALLWORDS = dfm(trainAmazon.tokens, tolower = FALSE)
dim(trainAmazon.tokens.ALLWORDS)
trainAmazon_LexDiv = textstat_lexdiv(trainAmazon.tokens.ALLWORDS, measure = c("all"))

# MATRIX <- DFM
trainAmazon.tokens.FUNCTION.matrix <- as.matrix(trainAmazon.tokens.dfm)

# TERM FREQUENCY FUNCTION <- create fucntion
term.frequency <- function(row) {
  row / sum(row)
}

# NORMALIZE all documents with TF  # we lose the RatingsAbsol column
trainAmazon.tokens.FUNCTION.dfm <- apply(trainAmazon.tokens.FUNCTION.matrix, 1, term.frequency)
dim(trainAmazon.tokens.FUNCTION.dfm)

# TRANSPOSE the matrix
trainAmazon.tokens.FUNCTION.dfm <- t(trainAmazon.tokens.FUNCTION.dfm)
dim(trainAmazon.tokens.FUNCTION.dfm)

# DF <- DFM+RatingsAbsol
# trainAmazon is a df and provides the RatingsAbsol vector
trainAmazon.tokens.FUNCTION.df <- cbind(RatingsAbsol = trainAmazon$RatingsAbsol,
as.data.frame(trainAmazon.tokens.FUNCTION.dfm))

# COLNAMES <- make names
names(trainAmazon.tokens.FUNCTION.df) <- make.names(names(trainAmazon.tokens.FUNCTION.df))

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############################### TEST DATA PREPROCESSING
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# Tokenization.
testAmazon.tok <- tokens(testAmazon$text, what = "word",
                         remove_numbers = TRUE, remove_punct = TRUE,
                         remove_symbols = TRUE, remove_hyphens = TRUE)

# Lower case the tokens.
testAmazon.tok <- tokens_tolower(testAmazon.tok)

# Stopword removal.
testAmazon.tokens <- tokens_select(testAmazon.tok, AbsolDict)

# Stemming.
testAmazon.tokens <- tokens_wordstem(testAmazon.tokens, language = "english")

# Lexival Diversity
testAmazon.tokens.ALLWORDS = dfm(testAmazon.tok, tolower = FALSE)
dim(testAmazon.tokens.ALLWORDS)
testAmazon_LexDiv = textstat_lexdiv(testAmazon.tokens.ALLWORDS, measure = c("all"))

# Convert n-grams to quanteda DOCUMENT-TERM FREQUENCY MATRIX matrix.
testAmazon.tokens.dfm <- dfm(testAmazon.tokens, tolower = FALSE)

# MATCH TEST WITH TRAIN
testAmazon.tokens.dfm <- dfm_select(testAmazon.tokens.dfm, pattern = trainAmazon.tokens.dfm,
                                    selection = "keep")


dim(testAmazon.tokens.dfm)

# Ensure the test dfm has the same n-grams as the training dfm.
#
# NOTE - In production we should expect that new text messages will
#        contain n-grams that did not exist in the original training
#        data. As such, we need to strip those n-grams out.
#

# MATRIX <- DFM
testAmazon.tokens.matrix <- as.matrix(testAmazon.tokens.dfm)
```

```
# NORMALIZE all documents with TF  # we lose the RatingsAbsol column
testAmazon.tokens.dfm <- apply(testAmazon.tokens.matrix, 1, term.frequency)
dim(testAmazon.tokens.dfm)

# TRANSPOSE the matrix
testAmazon.tokens.dfm <- t(testAmazon.tokens.dfm)
dim(testAmazon.tokens.dfm)

# DF <- DFM+RatingsAbsol
# trainAmazon is a df and provides the RatingsAbsol vector
testAmazon.tokens.df <- cbind(RatingsAbsol = testAmazon$RatingsAbsol,
as.data.frame(testAmazon.tokens.dfm))

# COLNAMES <- make names
names(testAmazon.tokens.df) <- make.names(names(testAmazon.tokens.df))

# Fix incomplete cases
summary(testAmazon.tokens.df[1,])
testAmazon.tokens.df[is.na(testAmazon.tokens.df)] <- 0.0
summary(testAmazon.tokens.df[1,])

#  ADD EXTRA FEATURES - LIWC and TTR

trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Exclam)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Apostro)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$WPS)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Parenth)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Comma)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Dash)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Sixltr)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Exclam)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Apostro)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$WPS)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Parenth)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Comma)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Dash)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Sixltr)

trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainAmazon_LexDiv$CTTR)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testAmazon_LexDiv$CTTR)


##### MOVEME FUNCTION #########
moveme <- function (invec, movecommand) {
  movecommand <- lapply(strsplit(strsplit(movecommand, ";")[[1]],
```

```
                              ",|\\s+"), function(x) x[x != ""])
  movelist <- lapply(movecommand, function(x) {
    Where <- x[which(x %in% c("before", "after", "first",
                              "last")):length(x)]
    ToMove <- setdiff(x, Where)
    list(ToMove, Where)
  })
  myVec <- invec
  for (i in seq_along(movelist)) {
    temp <- setdiff(myVec, movelist[[i]][[1]])
    A <- movelist[[i]][[2]][1]
    if (A %in% c("before", "after")) {
      ba <- movelist[[i]][[2]][2]
      if (A == "before") {
        after <- match(ba, temp) - 1
      }
      else if (A == "after") {
        after <- match(ba, temp)
      }
    }
    else if (A == "first") {
      after <- 0
    }
    else if (A == "last") {
      after <- length(myVec)
    }
    myVec <- append(temp, values = movelist[[i]][[1]], after = after)
  }
  myVec
}

##### MOVE RATINGS ABSOL LAST #########
colnames(trainAmazon.tokens.FUNCTION.df)
trainAmazon.tokens.FUNCTION.df =
trainAmazon.tokens.FUNCTION.df[moveme(names(trainAmazon.tokens.FUNCTION.df), "RatingsAbsol last")]
testAmazon.tokens.df = testAmazon.tokens.df[moveme(names(testAmazon.tokens.df), "RatingsAbsol last")]

# transform outcome variable to text as this is required in caret for classification
trainAmazon.tokens.FUNCTION.df$RatingsAbsol <-
ifelse(trainAmazon.tokens.FUNCTION.df$RatingsAbsol==1,'Absolute','Moderate')
testAmazon.tokens.df$RatingsAbsol <- ifelse(testAmazon.tokens.df$RatingsAbsol==1,'Absolute','Moderate')

trainAmazon.tokens.FUNCTION.df$RatingsAbsol = as.factor(trainAmazon.tokens.FUNCTION.df$RatingsAbsol)
```

```
testAmazon.tokens.df$RatingsAbsol = as.factor(testAmazon.tokens.df$RatingsAbsol)

dim(trainAmazon.tokens.FUNCTION.df)
dim(testAmazon.tokens.df)

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############################## NAIVE BAYES 1
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######

######## RUN NIAVE BAYES CLASSIFIER #########
library(e1071)
library(caret)
NiBayes_Amazon = naiveBayes(RatingsAbsol ~ ., data = trainAmazon.tokens.FUNCTION.df)
NiBayes_Amazon

PredictNiBayes = predict(NiBayes_Amazon, testAmazon.tokens.df, type="class")
confusionMatrix(table(PredictNiBayes, testAmazon.tokens.df$RatingsAbsol))


######  MOST IMPORTANT FEATURES ##########
roc_imp <- filterVarImp(x = trainAmazon.tokens.FUNCTION.df[, -ncol(trainAmazon.tokens.FUNCTION.df)], y =
trainAmazon.tokens.FUNCTION.df$RatingsAbsol)
roc_imp2 = roc_imp[order("Absolute")]
View(roc_imp2)

###### EXPORT AND IMPORT FILES ######
sink("/Users/mohammedalmosaiwi/Documents/Uni/Pythonwork/Valence/New_LSE_Updated/Niave_Bayes50.cs
v")
trainAmazon.tokens.FUNCTION.df
sink(NULL)
```

```
HF_Amazon =
read.csv("/Users/mohammedalmosaiwi/Documents/Uni/Pythonwork/Valence/New_LSE_Updated/HF_Moder.csv
", header = TRUE)

#####  WORDCLOUD  #######
library(tm)
library(SnowballC)
library(wordcloud)

set.seed(1234)
wordcloud(words = HF_Amazon[,1], freq = HF_Amazon[,2], min.freq = 1, scale = c(3, 0.2),
          max.words=100, random.order=FALSE, rot.per=0.35,
          colors=brewer.pal(8, "Dark2"))
######## IMPORTANT FEATURES ONLY CLASSIFIER ########
library(e1071)
library(caret)

NiBayes_Amazon = train(RatingsAbsol ~          but          +
                       seem          +
                       though        +
                       ever          +
                       howev         +
                       much          +
                       more          +
                       your          +
                       cant          +
                       somewhat                +
                       thank         +
                       rather        +
                       my            +
                       never         +
                       some          +
                       you           +
                       overal        +
                       will          +
                       too           +
                       `Amazonfiles_Diversity.dfm.VAL$CTTR` +
                       anyon         +
                       certain          , data = trainAmazon.tokens.FUNCTION.df)

PredictNiBayes = predict(NiBayes_Amazon, testAmazon.tokens.df, type="raw")
confusionMatrix(table(PredictNiBayes, testAmazon.tokens.df$RatingsAbsol))
NiBayes_Amazon
```

```
colnames(trainAmazon.tokens.FUNCTION.df)
##############################################################################################
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############################## CROSS VALIDATION
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##############################################################################################
######

# TOKENIZE
Amazonfiles.tokens = tokens(Amazonfiles$text, what = "word",
                            remove_numbers = TRUE, remove_punct = TRUE,
                            remove_symbols = TRUE, remove_hyphens = TRUE)

# LOWER CASE the tokens.
Amazonfiles.tokens = tokens_tolower(Amazonfiles.tokens)

# STOP WORDS
Amazonfiles.tokens <- tokens_select(Amazonfiles.tokens, stopwords(kind = "SMART"),
                                    selection = "keep")
# STEMMING
Amazonfiles.tokens <- tokens_wordstem(Amazonfiles.tokens, language = "english")

# DFM <- Preprosessed data
Amazonfiles.tokens <- dfm(Amazonfiles.tokens, tolower = FALSE)
dim(Amazonfiles.tokens)

# MATRIX <- DFM
Amazonfiles.tokens <- as.matrix(Amazonfiles.tokens)

# TERM FREQUENCY FUNCTION <- create fucntion
term.frequency <- function(row) {
  row / sum(row)
}
```

```
# NORMALIZE all documents with TF  # we lose the RatingsAbsol column
Amazonfiles.tokens <- apply(Amazonfiles.tokens, 1, term.frequency)
dim(Amazonfiles.tokens)

# TRANSPOSE the matrix
Amazonfiles.tokens <- t(Amazonfiles.tokens)
dim(Amazonfiles.tokens)

# DF <- DFM+RatingsAbsol
# trainAmazon is a df and provides the RatingsAbsol vector
Amazonfiles.tokens <- cbind(RatingsAbsol = Amazonfiles$RatingsAbsol, as.data.frame(Amazonfiles.tokens))

# COLNAMES <- make names
names(Amazonfiles.tokens) <- make.names(names(Amazonfiles.tokens))
library("dplyr")

Amazonfiles.tokens$RatingsAbsol <- as.factor(Amazonfiles.tokens$RatingsAbsol)
Amazonfiles.tokens$RatingsAbsol <- ifelse(Amazonfiles.tokens$RatingsAbsol==1,'Absolute','Moderate')


# TOKENIZE - LEXICAL DIVERSITY = Amazonfiles_Diversity.dfm.VAL
Amazonfiles_ALL = tokens(Amazonfiles$text, what = "word",
                         remove_numbers = TRUE, remove_punct = TRUE,
                         remove_symbols = TRUE, remove_hyphens = TRUE)
Amazonfiles_ALL = tokens_tolower(Amazonfiles_ALL)
Amazonfiles_Diversity.dfm <- dfm(Amazonfiles_ALL, tolower = FALSE)
Amazonfiles_Diversity.dfm.VAL = textstat_lexdiv(Amazonfiles_Diversity.dfm, measure = c("all"))


# ADD EXTRA FEATURES
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Exclam)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Apostro)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$WPS)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Parenth)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Comma)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Dash)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Sixltr)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, Amazonfiles_Diversity.dfm.VAL$CTTR)

dim(Amazonfiles.tokens)
colnames(Amazonfiles.tokens)

#################### BOOTSTRAPPING ######################
# load the library
```

```
library(caret)

# define training control
train_control <- trainControl(method="boot", number=100)
# train the model

NiBayes_Amazon_boot = train(RatingsAbsol ~  but         +
                            seem                +
                            though              +
                            ever                +
                            howev               +
                            much                +
                            more                +
                            your                +
                            cant                +
                            somewhat            +
                            thank               +
                            rather              +
                            my                  +
                            never               +
                            some                +
                            you                 +
                            overal              +
                            `Amazonfiles_Diversity.dfm.VAL$CTTR` +
                            anyon               +
                            certain             +
                            `LIWC_Amazon$Exclam` ,data = Amazonfiles.tokens,
                           trControl=train_control, method="nb")

# summarize results
print(NiBayes_Amazon_boot)

########### K FOLD CROSS VALIDATION #########
# load the library
library(caret)

# define training control
train_control <- trainControl(method="repeatedcv", number=10, repeats=3)

# train the model
NiBayes_Amazon_cv = train(RatingsAbsol ~     but         +
                          seem              +
                          though            +
                          ever         +
```

```
                howev           +
                much            +
                more    +
                your    +
                cant    +
                somewhat        +
                thank   +
                rather  +
                my      +
                never   +
                some            +
                you     +
                overal  +
                anyon           +
                `Amazonfiles_Diversity.dfm.VAL$CTTR` +
                certain +
                `LIWC_Amazon$Exclam` ,data = Amazonfiles.tokens,
              trControl=train_control, method="nb")
# summarize results
print(NiBayes_Amazon_cv)


########## LOOCV ###############

# load the library
library(caret)

# define training control
train_control <- trainControl(method="LOOCV")
# train the model
NiBayes_Amazon_loocv = train(RatingsAbsol ~ but         +
                  seem          +
                  though        +
                  ever          +
                  howev         +
                  much          +
                  more          +
                  your          +
                  cant          +
                  somewhat      +
                  thank         +
                  rather        +
                  my            +
```

```
                never           +
                some            +
                you             +
                overal          +
                anyon           +
                certain         +
                `LIWC_Amazon$Exclam` ,data = Amazonfiles.tokens,
               trControl=train_control, method="nb")
# summarize results
print(NiBayes_Amazon_loocv)


Amazonfiles.tokens$RatingsAbsol <- ifelse(Amazonfiles.tokens$RatingsAbsol=="Absolute",'1','2')

Amazonfiles.tokens = na.omit(Amazonfiles.tokens)
roc_imp <- filterVarImp(x = Amazonfiles.tokens[, -ncol(Amazonfiles.tokens)], y =
Amazonfiles.tokens$RatingsAbsol)
roc_imp2 = roc_imp[order("Absolute")]
View(roc_imp2)
head(roc_imp2, n = 50)

is.nan(Amazonfiles.tokens)

is.infinite(Amazonfiles.tokens)
View(Amazonfiles.tokens)
```

Appendix 12

Naïve Bayes Valence R Script

```
############ THINGS TO INSTALL #############
############ THINGS TO INSTALL #############
############ THINGS TO INSTALL #############
install.packages("Matrix")
install.packages("quanteda")
install.packages("devtools")
install_github("kbenoit/quantedaData")

devtools::install_github('kbenoit/quantedaData')
install.packages("tm")  # for text mining
install.packages("SnowballC") # for text stemming
install.packages("wordcloud") # word-cloud generator
install.packages("RColorBrewer") # color palettes
```

```
install.packages('caret', dependencies = TRUE)
install.packages("readtext")

library("devtools")
library(quanteda)
library(quantedaData)
library(readtext)
library(quanteda)
library(quantedaData)
library("quanteda", quietly = TRUE, warn.conflicts = FALSE)
library(caret)
library("tm")
library("SnowballC")
library("wordcloud")
library("RColorBrewer")


##### PREPROCESSING AMAZON DATA ############
##### PREPROCESSING AMAZON DATA ############
##### PREPROCESSING AMAZON DATA ############
require(quanteda)
require(readtext)
Amazonfiles <- readtext("/Users/mohammedalmosaiwi/Documents/Uni/Pythonwork/Valence/Text
Documents_Temp/*.txt")
LIWC_Amazon =
read.csv("/Users/mohammedalmosaiwi/Documents/Uni/Pythonwork/Valence/LIWC_VALENCE2.csv", header =
TRUE)

Amazonfiles["RatingsAbsol"] = (rep(c(1, 1, 2, 2, 2, 2, 2, 2, 2), len = nrow(Amazonfiles)))
Amazonfiles["Group"] = rep(1:3, each = 162, 90, 90, len = nrow(Amazonfiles))
Amazonfiles["Ratings"] = (rep(c(1, 10, 2, 3, 4, 5, 7, 8, 9), len = nrow(Amazonfiles)))
Amazonfiles["Valence"] = (rep(c(1, 2, 1, 1, 1, 3, 2, 2, 2), len = nrow(Amazonfiles)))
Amazonfiles[253:342, 4] = rep(3)
Amazonfiles[163:342, 3] = (rep(c(1, 2, 2, 2, 1), 36))
Amazonfiles[163:342, 5] = (rep(c(1, 2, 3, 4, 5), 36))
Amazonfiles[163:342, 6] = (rep(c(1, 1, 3, 2, 2), 36))

# head(Amazonfiles)
# View(Amazonfiles)

# RENAME headings in data.frame
names(Amazonfiles) <- c("Filename", "text", "RatingsAbsol", "Groups", "Ratings", "Valence")

# FACTORIZE (ratings), create new binary variable
```

```
Amazonfiles$RatingsAbsol <- as.factor(Amazonfiles$RatingsAbsol)
Amazonfiles$Groups <- as.factor(Amazonfiles$Groups)
Amazonfiles$Ratings <- as.factor(Amazonfiles$Ratings)
Amazonfiles$Valence <- as.factor(Amazonfiles$Valence)

# MISSING DATA check
length(which(!complete.cases(Amazonfiles)))

# DISTRIBUTION of groups check
prop.table(table(Amazonfiles$RatingsAbsol))
prop.table(table(Amazonfiles$Valence))

# FORMATTING - convert text to utf8
Amazonfiles$text = iconv(enc2utf8(Amazonfiles$text),sub="byte")

###FIND AND REPLACE within a data frame - cleaning data
Amazonfiles$text = gsub("\n", " ", Amazonfiles$text)
Amazonfiles$text = gsub("/", " ", Amazonfiles$text)
Amazonfiles$text = gsub("&", "and", Amazonfiles$text)

library(caret)
set.seed(32984)
Amazon.indexes <- createDataPartition(Amazonfiles$Valence, times = 1,
                                      p = 0.7, list = FALSE)


trainAmazon <- Amazonfiles[Amazon.indexes,]
testAmazon <- Amazonfiles[-Amazon.indexes,]
trainLIWC = LIWC_Amazon[Amazon.indexes,]
testLIWC = LIWC_Amazon[-Amazon.indexes,]

prop.table(table(trainAmazon$RatingsAbsol))
prop.table(table(testAmazon$RatingsAbsol))
prop.table(table(trainAmazon$Groups))
prop.table(table(testAmazon$Groups))

AmazonCorpus <- corpus(trainAmazon)
colnames(trainAmazon)
colnames(testAmazon)
colnames(trainLIWC)
colnames(testLIWC)


# TOKENIZE
trainAmazon.tokens = tokens(trainAmazon$text, what = "word",
                            remove_numbers = TRUE, remove_punct = TRUE,
```

```
                    remove_symbols = TRUE, remove_hyphens = TRUE)

# LOWER CASE the tokens.
trainAmazon.tokens = tokens_tolower(trainAmazon.tokens)

# STOP WORDS
trainAmazon.tokens.FUNCTION <- tokens_select(trainAmazon.tokens, stopwords(kind = "SMART"),
                                  selection = "keep")
# STEMMING
trainAmazon.tokens.FUNCTION <- tokens_wordstem(trainAmazon.tokens.FUNCTION, language = "english")

# DFM <- Preprosessed data
trainAmazon.tokens.dfm <- dfm(trainAmazon.tokens.FUNCTION, tolower = FALSE)
dim(trainAmazon.tokens.dfm)

# LEXICAL DIVERSITY - trainAmazon_LexDiv
trainAmazon.tokens.ALLWORDS = dfm(trainAmazon.tokens, tolower = FALSE)
dim(trainAmazon.tokens.ALLWORDS)
trainAmazon_LexDiv = textstat_lexdiv(trainAmazon.tokens.ALLWORDS, measure = c("all"))

# MATRIX <- DFM
trainAmazon.tokens.FUNCTION.matrix <- as.matrix(trainAmazon.tokens.dfm)

# TERM FREQUENCY FUNCTION <- create fucntion
term.frequency <- function(row) {
  row / sum(row)
}

# NORMALIZE all documents with TF  # we lose the RatingsAbsol column
trainAmazon.tokens.FUNCTION.dfm <- apply(trainAmazon.tokens.FUNCTION.matrix, 1, term.frequency)
dim(trainAmazon.tokens.FUNCTION.dfm)

# TRANSPOSE the matrix
trainAmazon.tokens.FUNCTION.dfm <- t(trainAmazon.tokens.FUNCTION.dfm)
dim(trainAmazon.tokens.FUNCTION.dfm)

# DF <- DFM+RatingsAbsol
# trainAmazon is a df and provides the RatingsAbsol vector
trainAmazon.tokens.FUNCTION.df <- cbind(Valence = trainAmazon$Valence,
as.data.frame(trainAmazon.tokens.FUNCTION.dfm))

# COLNAMES <- make names
names(trainAmazon.tokens.FUNCTION.df) <- make.names(names(trainAmazon.tokens.FUNCTION.df))
```

```
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############################## TEST DATA PREPROCESSING
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##############################################################################################
######

# Tokenization.
testAmazon.tok <- tokens(testAmazon$text, what = "word",
                         remove_numbers = TRUE, remove_punct = TRUE,
                         remove_symbols = TRUE, remove_hyphens = TRUE)

# Lower case the tokens.
testAmazon.tok <- tokens_tolower(testAmazon.tok)

# Stopword removal.
testAmazon.tokens <- tokens_select(testAmazon.tok, stopwords(kind = "SMART"),
                                   selection = "keep")

# Stemming.
testAmazon.tokens <- tokens_wordstem(testAmazon.tokens, language = "english")

# Lexival Diversity
testAmazon.tokens.ALLWORDS = dfm(testAmazon.tok, tolower = FALSE)
dim(testAmazon.tokens.ALLWORDS)
testAmazon_LexDiv = textstat_lexdiv(testAmazon.tokens.ALLWORDS, measure = c("all"))

# Convert n-grams to quanteda DOCUMENT-TERM FREQUENCY MATRIX matrix.
testAmazon.tokens.dfm <- dfm(testAmazon.tokens, tolower = FALSE)

# MATCH TEST WITH TRAIN
testAmazon.tokens.dfm <- dfm_select(testAmazon.tokens.dfm, pattern = trainAmazon.tokens.dfm,
                                    selection = "keep")
dim(testAmazon.tokens.dfm)
```

```
# Ensure the test dfm has the same n-grams as the training dfm.
#
# NOTE - In production we should expect that new text messages will
#       contain n-grams that did not exist in the original training
#       data. As such, we need to strip those n-grams out.
#

# MATRIX <- DFM
testAmazon.tokens.matrix <- as.matrix(testAmazon.tokens.dfm)

# NORMALIZE all documents with TF  # we lose the RatingsAbsol column
testAmazon.tokens.dfm <- apply(testAmazon.tokens.matrix, 1, term.frequency)
dim(testAmazon.tokens.dfm)

# TRANSPOSE the matrix
testAmazon.tokens.dfm <- t(testAmazon.tokens.dfm)
dim(testAmazon.tokens.dfm)

# DF <- DFM+RatingsAbsol
# trainAmazon is a df and provides the RatingsAbsol vector
testAmazon.tokens.df <- cbind(Valence = testAmazon$Valence, as.data.frame(testAmazon.tokens.dfm))

# COLNAMES <- make names
names(testAmazon.tokens.df) <- make.names(names(testAmazon.tokens.df))

# Fix incomplete cases
summary(testAmazon.tokens.df[1,])
testAmazon.tokens.df[is.na(testAmazon.tokens.df)] <- 0.0
summary(testAmazon.tokens.df[1,])

#  ADD EXTRA FEATURES - LIWC and TTR

trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Exclam)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Apostro)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$WPS)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Parenth)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Comma)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Dash)
trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainLIWC$Sixltr)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Exclam)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Apostro)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$WPS)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Parenth)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Comma)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Dash)
```

```
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testLIWC$Sixltr)

trainAmazon.tokens.FUNCTION.df = cbind(trainAmazon.tokens.FUNCTION.df, trainAmazon_LexDiv$CTTR)
testAmazon.tokens.df = cbind(testAmazon.tokens.df, testAmazon_LexDiv$CTTR)

##### MOVEME FUNCTION #########
moveme <- function (invec, movecommand) {
 movecommand <- lapply(strsplit(strsplit(movecommand, ";")[[1]],
                                ",|\\s+"), function(x) x[x != ""])
 movelist <- lapply(movecommand, function(x) {
  Where <- x[which(x %in% c("before", "after", "first",
                            "last")):length(x)]
  ToMove <- setdiff(x, Where)
  list(ToMove, Where)
 })
 myVec <- invec
 for (i in seq_along(movelist)) {
  temp <- setdiff(myVec, movelist[[i]][[1]])
  A <- movelist[[i]][[2]][1]
  if (A %in% c("before", "after")) {
   ba <- movelist[[i]][[2]][2]
   if (A == "before") {
    after <- match(ba, temp) - 1
   }
   else if (A == "after") {
    after <- match(ba, temp)
   }
  }
  else if (A == "first") {
   after <- 0
  }
  else if (A == "last") {
   after <- length(myVec)
  }
  myVec <- append(temp, values = movelist[[i]][[1]], after = after)
 }
 myVec
}

##### MOVE RATINGS ABSOL LAST #########
colnames(trainAmazon.tokens.FUNCTION.df)
trainAmazon.tokens.FUNCTION.df =
trainAmazon.tokens.FUNCTION.df[moveme(names(trainAmazon.tokens.FUNCTION.df), "Valence last")]
```

```
testAmazon.tokens.df = testAmazon.tokens.df[moveme(names(testAmazon.tokens.df), "Valence last")]

# transform outcome variable to text as this is required in caret for classification
trainAmazon.tokens.FUNCTION.df$Valence <-
ifelse(trainAmazon.tokens.FUNCTION.df$Valence==1,'Negative','Positive')
testAmazon.tokens.df$Valence <- ifelse(testAmazon.tokens.df$Valence==1,'Negative','Positive')

trainAmazon.tokens.FUNCTION.df$Valence = as.factor(trainAmazon.tokens.FUNCTION.df$Valence)
testAmazon.tokens.df$Valence = as.factor(testAmazon.tokens.df$Valence)

dim(trainAmazon.tokens.FUNCTION.df)
dim(testAmazon.tokens.df)

##############################################################################################
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############################## NAIVE BAYES 1
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######

######## RUN NIAVE BAYES CLASSIFIER #########
library(e1071)
library(caret)
NiBayes_Amazon = naiveBayes(Valence ~ ., data = trainAmazon.tokens.FUNCTION.df)
NiBayes_Amazon

PredictNiBayes = predict(NiBayes_Amazon, testAmazon.tokens.df, type="class")
confusionMatrix(table(PredictNiBayes, testAmazon.tokens.df$Valence))


######  MOST IMPORTANT FEATURES ##########
roc_imp <- filterVarImp(x = trainAmazon.tokens.FUNCTION.df[, -ncol(trainAmazon.tokens.FUNCTION.df)], y =
trainAmazon.tokens.FUNCTION.df$Valence)
roc_imp2 = roc_imp[order("Absolute")]
View(roc_imp2)
```

```
###### EXPORT AND IMPORT FILES ######
sink("/Users/mohammedalmosaiwi/Documents/Uni/Pythonwork/Valence/New_LSE_Updated/Niave_Bayes50.csv")
colnames(trainAmazon.tokens.FUNCTION.df)
sink(NULL)

HF_Amazon =
read.csv("/Users/mohammedalmosaiwi/Documents/Uni/Pythonwork/Valence/New_LSE_Updated/HF_Moder.csv", header = TRUE)

#####  WORDCLOUD  #######
library(tm)
library(SnowballC)
library(wordcloud)

set.seed(1234)
wordcloud(words = HF_Amazon[,1], freq = HF_Amazon[,2], min.freq = 1, scale = c(3, 0.2),
          max.words=100, random.order=FALSE, rot.per=0.35,
          colors=brewer.pal(8, "Dark2"))
####### IMPORTANT FEATURES ONLY CLASSIFIER ########
library(e1071)
library(caret)

NiBayes_Amazon = train(Valence ~ no + also + definit + sorri + noth + well +
                         even + ani + not + overal + as + whi + oh + quit +
                         pleas + ok + cannot + instead + never + littl + best +
                         someon + though + mayb + especi, data = trainAmazon.tokens.FUNCTION.df)

PredictNiBayes = predict(NiBayes_Amazon, testAmazon.tokens.df, type="raw")
confusionMatrix(table(PredictNiBayes, testAmazon.tokens.df$Valence))
NiBayes_Amazon

colnames(trainAmazon.tokens.FUNCTION.df)
##############################################################################################
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######
############################## CROSS VALIDATION
##########################################
```

```
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######

# TOKENIZE
Amazonfiles.tokens = tokens(Amazonfiles$text, what = "word",
                            remove_numbers = TRUE, remove_punct = TRUE,
                            remove_symbols = TRUE, remove_hyphens = TRUE)

# LOWER CASE the tokens.
Amazonfiles.tokens = tokens_tolower(Amazonfiles.tokens)

# STOP WORDS
Amazonfiles.tokens <- tokens_select(Amazonfiles.tokens, stopwords(kind = "SMART"),
                                    selection = "keep")
# STEMMING
Amazonfiles.tokens <- tokens_wordstem(Amazonfiles.tokens, language = "english")

# DFM <- Preprosessed data
Amazonfiles.tokens <- dfm(Amazonfiles.tokens, tolower = FALSE)
dim(Amazonfiles.tokens)

# MATRIX <- DFM
Amazonfiles.tokens <- as.matrix(Amazonfiles.tokens)

# TERM FREQUENCY FUNCTION <- create fucntion
term.frequency <- function(row) {
  row / sum(row)
}

# NORMALIZE all documents with TF  # we lose the RatingsAbsol column
Amazonfiles.tokens <- apply(Amazonfiles.tokens, 1, term.frequency)
dim(Amazonfiles.tokens)

# TRANSPOSE the matrix
Amazonfiles.tokens <- t(Amazonfiles.tokens)
dim(Amazonfiles.tokens)

# DF <- DFM+RatingsAbsol
# trainAmazon is a df and provides the RatingsAbsol vector
Amazonfiles.tokens <- cbind(Valence = Amazonfiles$Valence , as.data.frame(Amazonfiles.tokens))

# COLNAMES <- make names
```

```
names(Amazonfiles.tokens) <- make.names(names(Amazonfiles.tokens))
library("dplyr")

Amazonfiles.tokens$Valence <- as.factor(Amazonfiles.tokens$Valence)
Amazonfiles.tokens$Valence <- ifelse(Amazonfiles.tokens$Valence==1,'Negative','Positive')


# TOKENIZE - LEXICAL DIVERSITY = Amazonfiles_Diversity.dfm.VAL
Amazonfiles_ALL = tokens(Amazonfiles$text, what = "word",
                         remove_numbers = TRUE, remove_punct = TRUE,
                         remove_symbols = TRUE, remove_hyphens = TRUE)
Amazonfiles_ALL = tokens_tolower(Amazonfiles_ALL)
Amazonfiles_Diversity.dfm <- dfm(Amazonfiles_ALL, tolower = FALSE)
Amazonfiles_Diversity.dfm.VAL = textstat_lexdiv(Amazonfiles_Diversity.dfm, measure = c("all"))


# ADD EXTRA FEATURES
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Exclam)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Apostro)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$WPS)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Parenth)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Comma)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Dash)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, LIWC_Amazon$Sixltr)
Amazonfiles.tokens = cbind(Amazonfiles.tokens, Amazonfiles_Diversity.dfm.VAL$CTTR)

dim(Amazonfiles.tokens)
colnames(Amazonfiles.tokens)

#################### BOOTSTRAPPING ####################
# load the library
library(caret)

# define training control
train_control <- trainControl(method="boot", number=100)
# train the model


NiBayes_Amazon_boot = train(Valence ~ no + also + definit + sorri + noth + well +
      even + ani + not + overal + as + whi + oh + quit +
      pleas + ok + cannot + instead + never + littl + best +
      someon + though + mayb + especi + `Amazonfiles_Diversity.dfm.VAL$CTTR`, data = Amazonfiles.tokens,
                  trControl=train_control, method="nb")
```

```
# summarize results
print(NiBayes_Amazon_boot)

########### K FOLD CROSS VALIDATION #########
# load the library
library(caret)

# define training control
train_control <- trainControl(method="repeatedcv", number=10, repeats=3)

# train the model
NiBayes_Amazon_cv = train(Valence ~ no + also + definit + sorri + noth + well +
                          even + ani + not + overal + as + whi + oh + quit +
                          pleas + ok + cannot + instead + never + littl + best +
                          someon + though + mayb + especi,data = Amazonfiles.tokens,
                        trControl=train_control, method="nb")
# summarize results
print(NiBayes_Amazon_cv)


########## LOOCV ###############

# load the library
library(caret)

# define training control
train_control <- trainControl(method="LOOCV")
# train the model
NiBayes_Amazon_loocv = train(Valence ~ no + also + definit + sorri + noth + well +
                           even + ani + not + overal + as + whi + oh + quit +
                           pleas + ok + cannot + instead + never + littl + best +
                           someon + though + mayb + especi,data = Amazonfiles.tokens,
                         trControl=train_control, method="nb")

# summarize results
print(NiBayes_Amazon_loocv)


Amazonfiles.tokens$Valence <- ifelse(Amazonfiles.tokens$Valence=="Absolute",'1','2')

Amazonfiles.tokens = na.omit(Amazonfiles.tokens)
roc_imp <- filterVarImp(x = Amazonfiles.tokens[, -ncol(Amazonfiles.tokens)], y = Amazonfiles.tokens$Valence)
roc_imp2 = roc_imp[order("Absolute")]
View(roc_imp2)
head(roc_imp2, n = 50)
```

```
is.nan(Amazonfiles.tokens)

is.infinite(Amazonfiles.tokens)
View(Amazonfiles.tokens)
```

Appendix 13

Our Predictions

Independent variables and hypotheses

Behavioural

DV = Participants responses - select the statement they most/least prefer

IV 1 = Absolutist/Non absolutist
IV 2 = Valence (Positive, Negative)
IV 3 = Situation category - Social (i.e. party), Achievement (i.e. exam), Core needs (Safety)
IV 4 = Statement structure - Probability/Magnitude

Key hypothesis

- Absolutist negative statements will be the least preferred
- Non-absolutist positive statements will be the most preferred
- "Core needs" more prone to absolutist responses than social and achievement situations

Exploratory

- Probability/magnitude

Physiology

DV = SCR, frequency N-SCR and SCL

- Absolutist statements will induce more SCR's and higher frequency of NSCR's.
- Absolutist statements will have higher SCL

DV = HRV
- Exploratory

Subjective questionnaires

Depression Anxiety Scale (DAS)
- Higher scores will correlate with greater endorsement of positive absolutist appraisal.

Attribution Style Questionnaire (ASQ)
- Largely exploratory
- Extreme responses may correlate with more positive absolutist endorsing and higher DAS.

Dysfunctional Attitude Scale (DASS)
- Largely exploratory
- Extreme responses may correlate with more positive absolutist endorsing and higher DAS.

Appendix 14

Consent Form

1. I have read and had explained to me by ……

   the accompanying Information Sheet relating to the project on:
   Investigating maladaptive processes of appraisal generation

2. I have had explained to me the purposes of the project and what will be required of me, and any questions I have had have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

3. I understand that participation is entirely voluntary and that I have the right to withdraw from the project any time, and that this will be without detriment.

4. I understand that all personal information will remain confidential to the Investigator and arrangements for the storage and eventual disposal of any identifiable material have been made clear to me

5. This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

6. I have received a copy of this Consent Form and of the accompanying Information Sheet.

Name: ……

Signed: ……

Date: ……

University of Reading

Appendix 15

Title of Study: Investigating maladaptive processes of appraisal generation

Information Sheet

Supervisor:	Email:	Phone:
Dr T Johnstone	[redacted]	[redacted]

Experimenters:
Mr M Al-Mosaiwi (PhD student) m.a.a.almosaiwi@pgr.reading.ac.uk

You are being asked to take part in a research study that investigates a particular aspect of ordinary emotion regulation. You have been selected on basis that you are over 18 and have no history of neuropsychological illness. I am a first year PhD student and this experiment will constitute a part of my PhD degree. It is affiliated with the Reading School of Psychology and Clinical Language Studies and is supervised by prof. Johnstone. Before you decide to participate, please read the following information detailing practical aspects of the study.

You will be asked to complete an experimental task followed by a number of short questionnaires. During the task you will be presented with a number of different scenarios with accompanying statements. These scenarios will depict commonly encountered situations (i.e. job interview) and the accompanying statements should be treated as examples of possible 'self-talk' (things you say to yourself). The self-talk statements will relate to the depicted scenario and will be more or less positive or negative. You will be asked to rank these statements according to your personal preference. Later you will be asked to read the same statements out loud with a sensor attached to your finger. Finally you will be asked to complete some short questionnaires regarding your mood and process of thinking. The total experimental time might range from approximately 40 - 60 minutes to complete.

You have the right to withdraw from the study at any time, without explanation or detriment. Your data can also be withdrawn from the study, at any time before the point of any publication. The UK Data Protection Act 1998 will apply to all information gathered. This will either be held on password-locked computer files or locked cabinets within the School of Psychology and Clinical Language Studies. In many instances your identity will be anonymised, and this will certainly be the case if any of your data is disseminated in any way. At all times there will be no possibility of you as an individual being linked with the data. This study will not have access to any of your medical records. Personally identifiable information will be held for 5 years before secure disposal. Anonymised data from this study might be made available to other researchers, in line with current Research council guidelines for data sharing.

Please feel free to ask any questions that you may have about this study at any point, your results can be supplied to you at the end if requested. Expenses are not expected and are not covered.

This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. **Thank you for your help.**

Appendix 22

Study Debriefing

University of Reading

School of Psychology and Clinical Language Sciences
Whitenights
Reading RG6 6AL

Thank you for taking part in this study.

This study was designed to compare "absolutist thinking" with "extreme thinking". I define absolutist thinking as all-or-nothing assessments which are binary in nature and extreme to the point of totality. Extreme thinking is the endorsement of an extreme position along a continuum, but not absolutist.

It is hoped that this comparison will reveal the unique effect of absolutist thinking independent of extreme thinking. I predict that absolutist appraisals are more rigid and irrational, leading to poorer emotion regulation. More sophisticated non-absolutist appraisals consider the many nuances in a given situation and allow individuals more adaptive responding to continually changing environments.

How was this tested?
You will have seen a number of different depicted scenarios. These were accompanied by a number of statements. The statements varied either in valence (positive/negative) or their absolutist nature (absolutist or non-absolutist). You were then asked to select the statement most/least preferred.

In section two, you were presented with statement fragments which either pertained to the probability of an outcome (I am certain…) or the magnitude of an outcome (…is perfect). They were in absolutist and non-absolutist versions and you were asked to construct an appraisal statement from these elements. The aim of these tasks was to study your preference for absolutist over extreme assessments (or vise versa). You also read the statements while skin conductance response (sweat response) was measured. Here I wanted to see if you reacted more emotionally to absolutist statements than extreme statements. Finally you completed a battery of questionaries' designed to test psychological factors pertaining to irrationality, absolutism and style of thinking. I will compare the results of these to your answers in the experimental task and see if there are any links.

Background Theory
Being positive is important in order for a person to achieve their various goals, however I predict that being absolutely positive is damaging. The same way that pressing the accelerator in a car is important to getting home, but dogmatically only pressing the accelerator will lead to a crash. Similarly, being positive will aid goal achievement, however absolute positivity will likely hamper goal achievement. I therefore predicted that participants will prefer the extremely positive non-absolutist appraisals over extremely positive absolutist appraisals.
In the second part of the study, I aimed to deduce whether people have a preference for absolutist thinking in the magnitude of an outcome or its certainty. If a significantly larger number of participants chose absolutist versions of statement fragments denoting certainty or magnitude, this will reveal a bias for absolutism in that appraisal component.

Why is this important to study?
It is hoped that this project could be the first in a series of experiments along the same lines. In building a picture of the impact of absolutism on emotion regulation, I aim to inform clinical practitioners dealing with a variety of emotional disturbances. Empirical validation of this approach is needed before a greater emphasis on its implementation in the clinical setting takes effect. I respectfully ask that you do not reveal the contents of this study to other students or colleagues as this will compromise the validity of data collected in the future

What if I want to know more?
If you are interested in the subject of the study or have any questions regarding it, please contact:
Mohammed Al-Mosaiwi
[redacted]

Debrief Questions

1. **What were the two main independent variables in this experiment?**
2. **What can 'skin conductance response" reveal?**